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FINAL
ENVIRONMENTAL STATEMENT

For a Proposed
1973 OUTER CONTINENTAL SHELF
OIL AND GAS GENERAL LEASE SALE
OFFSHORE MISSISSIPPI, ALABAMA, AND FLORIDA

OCS SALE NO. 32
FES 73–60

Volume 2 of 5

Potential Environmental Impacts
and
Mitigating Measures

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1973
v.2

Prepared by the
BUREAU OF LAND MANAGEMENT
U.S. DEPARTMENT OF THE INTERIOR

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III. ENVIRONMENTAL IMPACT OF THE PROPOSED SALE

A. Introduction

The developmental and production activity following this proposed sale could result in a variety of impacts on the natural environment, on other Gulf of Mexico resource uses, on air and water quality, on land use patterns, on the social order, and on the economy. In the light of existing operating practices, regulations, economics, and technology, some impacts are the unavoidable result of routine operations and the probability of their occurrence is 1, or 100%. Other impact-producing events must be viewed as accidental, not a part of day-to-day operations, but caused by occasional human error or equipment failure. Still other impacts can be controlled or avoided by safe operating practices and by regulations.

This introductory section is devoted to setting the stage for the discussion of actual impacts by briefly describing impact-producing operations and events, and where possible, citing statistics and examples. Each subsection contains an estimation of the magnitude or extent or duration of impact which can be expected if the proposed lease sale is held. The reader is reminded that routine oil and gas operations are described in Vol. 1, Sec. I. F.

1. Impacts Resulting From Day-to-Day Operations Which are Unavoidable Under Existing Operating Practices, Regulations, Economics and Technology

a. Discharge of Cleaned Drilling Muds and Drill Cuttings

The drilling mud and casing programs, and drill cuttings volume of a representative 10,000-foot offshore well were discussed in Vol. 1, Sec. I. F. 3. b. Many wells resulting from the proposed leasing could be drilled and produced at total depths of up to 15,000 feet. Drilling wells of this depth would require approximately 9,600 bbl. of seawater drilling muds made up from about 1,440 bbl. of commercial mud components and 9,600 bbl. of seawater. Table 1 shows the volume of cuttings generated by the 15,000 foot well.

Table 1

VOLUME OF DRILL CUTTINGS GENERATED AND DRILLING MUDS USED IN A 15,000-FOOT WELL (Based on Table 5, Vol. 1, Sec. I. F. 3. b.)

Interval (Feet)	Hole Size (Inches)	Volume of Cuttings (Bbl.)	Approx. Weight of Cuttings (lb.)	Drilling Mud Type	Mud System Volume (Bbl.)
0-1000	24	571	503,000	seawater & natural mud	As required
1000-4500	15	734	592,000	Gelled seawater	940
4500-15,000	9 7/8	993	803,000	Ferrochrome Lignosulfonate	1,210

During the course of drilling this representative 15,000-foot well, 110 tons of commercial mud components and 949 tons of drill cuttings will be discharged overboard.

The Geological Survey has estimated that between 700 and 1,120 wells would be required to develop the proposed acreage. At this time it would be premature to narrow the range of possible wells or predict the numbers of wells drilled to around 10,000 feet and those drilled to around 15,000 feet. Therefore, in order to predict the total quantity of drill cuttings and muds discharged as a result of this sale, it will be necessary to consider the entire range of from 700 to 1,120 wells drilled at 10,000 to 15,000 feet in depth. The reader should bear in mind that the real figure is probably somewhere near the middle.

The drilling of 700 10,000-foot wells would result in the discharge of 486,500 tons of drill cuttings and 56,000 tons of commercial mud components. The drilling of 1,120 15,000-foot well would yield 1,062,880 tons of drill cuttings and 123,000 tons of commercial mud components.

Drill cuttings are, of course, composed of shattered and pulverized sediment and underlying native rock. In considering impact, it is also relevant to examine those components of the drilling mud which will be discharged. The following table (Table 2) briefly identifies these components. The reader should bear in mind that this discussion is based on the representative well drilling mud program used in Vol. 1, Sec. 1. F. 3. b. and other compounds, listed in Table 6, of that section, could be added in special cases.

b. Discharge of Produced Formation Water

There is no geological evidence on which the amount of formation waters produced from wells resulting from this proposal can

Table 2 COMPONENTS OF DRILLING MUDS WHICH ARE NORMALLY DISCHARGED INTO THE SEA

Substance	Source	Use	Composition	Known Hazard
Attapulgite clay	Quarry	To cause gelling of salt water based muds	A light green magnesium-rich clay, quarried as "Fullers Earth"	NONE
Bentonite Clay	Quarry	To cause gelling of freshwater based muds	A light-colored montmorillonitic clay; slippery sticky when wet; swells to 10-20 times its dry volume	NONE
Caustic soda	Electrolysis of sodium chloride brine	For pH control	Sodium hydroxide, NaOH	Corrosive in concentrated form; not harmful after mixing into mud at low concentration and allowed to react
Ferrochrome lignosulfonate	Digestion of wood by sulfonate process; removal of cellulose; reaction with chromium compounds	Dispersant and emulsifier	Ferrochrome salt of lignosulfonic acid; content: Fe-2.6%, Cr-3.0%, S-5.5%	Possible chromium toxicity in pure form, none known from diluted form in muds
Organic polymer	Chemical process with plant starch, wood fiber as raw materials	Conditioner, texturizer	Starch, cellulosic derivatives	NONE
Pregelatinized starch	Plant starch	Filtrate reducer	Chemically similar to corn starch	NONE
Proprietary defoamer	Soap making process	Defoamer	Aluminum stearate $\text{Al/Ch}_3(\text{CH}_2)_{16}/_3$	NONE

be predicted. Several years ago an estimate was made that all producing OCS wells offshore Louisiana (about 3,500) produced 240,000 bbl. per day of formation water. A recent check showed that the Florida Jay Field, just north of the western part of the area included in this proposal, produced very little water at all. It is well known that some hydrocarbon reservoirs contain substantial amounts of water, whereas others contain almost none. Therefore, no predictions will be made at this time concerning the amount of formation water production which may be expected. While substantial amounts will likely be discharged into the sea, a significant proportion will also be reinjected into subsurface formations.

The mineral content of formation waters also cannot be predicted. Some fields in Texas produce almost pure water whereas, as was cited in Vol. 1, Sec. I. F. 3. c., a Michigan field produced brines containing 624,798 ppm mineral salts. The average total dissolved solids of 76 samples from southern Louisiana and the Outer Continental Shelf was found to be 112,513 milligrams per liter (mg/l) with a high of 270,400 mg/l and low of 61,552 mg/l. They commonly contain varying amounts of iron, calcium, magnesium, sodium, bicarbonates, sulphate, and chloride, with sodium and chloride being the most abundant ions. For informative purposes, the following table which shows the content of three representative brines (formation water) from offshore Louisiana is included below. They are classed as formation waters containing (1) high solids, (2) average solids, (3) low solids. For comparative purposes, an

Table 3 CHEMICAL CONTENT OF REPRESENTATIVE OFFSHORE BRINES 1/

		Offshore Louisiana						Jay Field, Florida	
Component		High Solids		Average Solids		Low Solids		Specific Gravity : 1.234	
		Mg/l	%	Mg/l	%	Mg/l	%	Mg/l	%
Iron	Fe	153	0.057	15	0.011	139	0.226	dissolved 1 insoluble 6 } 7	0.002
Calcium	Ca	17,000	6.287	4,675	3.294	772	1.254	39,947	12.830
Magnesium	Mg	2,090	0.773	1,030	0.726	152	0.247	5,102	1.639
Sodium	Na^+	84,500	31.250	49,120	34.612	22,651	36.800	71,072	22.826
Bicarbonate	HCO_3^-	37	0.014	100	0.070	933	1.516	195	0.063
Sulfate	$SO_4^=$	120	0.044	0	0	188	0.305	20	0.006
Chloride	Cl^-	166,500	61.575	86,975	61.287	36,717	59.652	195,030	62.637
Total Solids		270,400	100%	141,915	100%	61,552	100%	311,367	100%

1/ From U.S. Geological Survey, Oil and Gas Supervisor, Gulf of Mexico Area. New Orleans, Louisiana.

analysis of formation waters from the Jay Field (Florida) is included in that last column.

In addition to water quality degradation from high mineral content and low dissolved oxygen, a very small amount of oil is entrained in formation waters which are discharged into the sea. OCS operating orders require that the average oil content at the point of discharge must not average more than 50 ppm.

The MIT Offshore Oil Tank Group (MIT, 1973) has estimated that biologically, this could be the most significant of all minor discharges, for this oil could contain a high percentage of water soluble aromatics. They note however, that there appears to be no data on the fractional composition of the oil remaining in the water after treatment in the oil/water separators. The separation process is ineffective against that portion of the oil which is dissolved into the water.

c. Disposal of Solid Waste and Sewage

See Vol. 1, Sec. I. F. 3. e. for a description of source, content, treatment, and disposition. No prediction of volume or potential impact will be made at this time.

d. Disruption of Sea Floor and Resuspension of Sediments During Pipeline Burial

See Vol. 1, Sec. I. F. 4. a. for a description of this operation. During pipeline burial, a large volume of sediment is disrupted and resuspended for a short time in the overlying waters. Unfortunately, it is impossible to calculate a reasonably accurate volume of material that is reworked because the width of the trench varies greatly with compactness and the fluidization point of the sediment. A very rough estimate of the trench dimensions is 5 feet deep by 6 to 12 feet wide. Assuming a parabolic cross-section, approximately 4,000-8,000 cubic yards per mile would be disturbed, some of which would be resuspended. This figure cannot be applied to Geological Surveys prediction of 480-800 miles of pipeline resulting from this sale because some of that mileage includes sections in water deeper than 200 feet, where burial is not now required, sections of the gathering systems around groups of platforms where burial may not be required, sections in State waters where the Department has no jurisdiction and cannot require burial, and sections laid onshore. At some future date, when exact pipeline routes are drawn, our figure may be used as a multiplier to determine the total volume of sediments disturbed. The establishment of pipeline corridors is considered in Vol. 2, Sec. IV. C.

e. Digging of Trenches and "Push-ditches"

The volume of material reworked is of little concern here; instead, the width of upland or wetland disturbed and devegetated is of importance. Our rough estimate is that perhaps 50 to 60 feet of land will be extensively driven over by construction and burial equipment, resulting in some damage to vegetation and compaction of soil in vehicle tracks. Actual disturbance of soil and complete removal of vegetation will occur in a band of perhaps 30 to 40 feet. At this time we do not know how many miles of pipeline will be buried onshore through wetlands or elevated terrain. The establishment of pipeline corridors is considered in Vol. 2, Sec. IV. C.

f. Placement of Temporary and Permanent Platforms, Boats, Barges, and Pipelines in Conflict with Commercial Fishery Trawling Operations and Ship Navigation

As a result of this proposed sale, Geological Survey estimates between 75 and 125 platforms will be placed in this area. As discussed in section III. D., there are three factors that will affect the commercial fishing in this area. These are (1) the removal of sea floor from use by trawlers, (2) the creation of obstructions on the sea floor that cause damage to trawling nets, and (3) the possible contamination of fish by spilled oil.

Ship traffic will increase as a result of this sale which in turn will increase the possibility of ship and platform collisions. Previous records of collisions are discussed in section III. A. 2. d.

Geological Survey also predicts an additional 480 to 800 miles of pipeline in the proposed area. Because of the administrative procedures concerning the burial of common carrier pipelines in water depths under 200 feet, no adverse affects are predicted. It should be noted that only 18 of the proposed 147 tracts lie partly or completely beyond the 200 foot contour.

g. Placement of Structures, Pipeline Burial Cuts, Ancillary Onshore Facilities Where they May Degrade the Scenic Values of the Area

As stated in section III. G. 1. and 2., there will be no platforms visible from the mainland shore, although a few may possibly be visible from the Mississippi and Alabama offshore islands on a very clear day.

Ancillary onshore facilities will be constructed where the pipelines come ashore. These facilities will require approximately 40 acres each for construction and operation. And, as estimated in section III. G. 2., the negative impact on the aesthetic values of the pipeline burial cuts will diminish in about a year.

2. Impacts Resulting from Accidents

In any complex industrial operation involving heavy equipment, flammable materials, work at sea, large numbers of employees, and a large-scale reliance on complex technology, it is inevitable that accidents will occur. Thus, although theoretically avoidable, impacts resulting from accidents can be viewed as unavoidable in a statistical sense. It has been possible to gather data and derive statistical frequencies for some of these events, and present them below. An attempt has also been made to predict the number and amount of impact producing events which will result if this proposed lease sale is conducted.

a. Natural Gas Leaks Associated with Blowouts

Information furnished by the Geological Survey for the period 1956-1972 lists 36 gas leaks associated with well blowouts during OCS oil and gas operations in the Gulf of Mexico. Ten of these incidents involved fires and five were associated with oil or condensate spills. The duration of the blowouts ranged from two hours to over seven months. Several incidents resulted in the injury and death of members of the crew, and damage or loss of valuable equipment. Environmental damage has never been observed to result from natural gas blowouts and no estimates of the amount of gas lost have been made.

b. Oil Spills Greater Than 50 Bbl. in Size

Note that we do not entitle this section "Major" or "Massive" or "Large" etc. Several governmental agencies have endeavored to establish a system for oil spill size classification, i.e., the U.S. Coast Guard, U.S. Geological Survey, Environmental Protection Agency. Because these classification systems are not similar, we choose not to adopt any of them, but instead, we believe any spill of 50 bbl. or more is significant enough to receive individual consideration. Data supplied by the Geological Survey for the period 1964-1972 indicate a total of 39 oil spill incidents connected with Federal OCS oil and gas operations in the Gulf of Mexico involving 50 bbl. or more of oil and condensate.

The estimated total volume of oil spilled during this period as a result of these incidents is slightly less than 280,000 bbl. A distribution of these 39 incidents as to type and amount spilled is presented in Fig. 1.

In the following discussion of oil spills by type, several predictions will be made by comparing the volumes of these spills and the total production of oil and condensate during the same period, 2.6 million

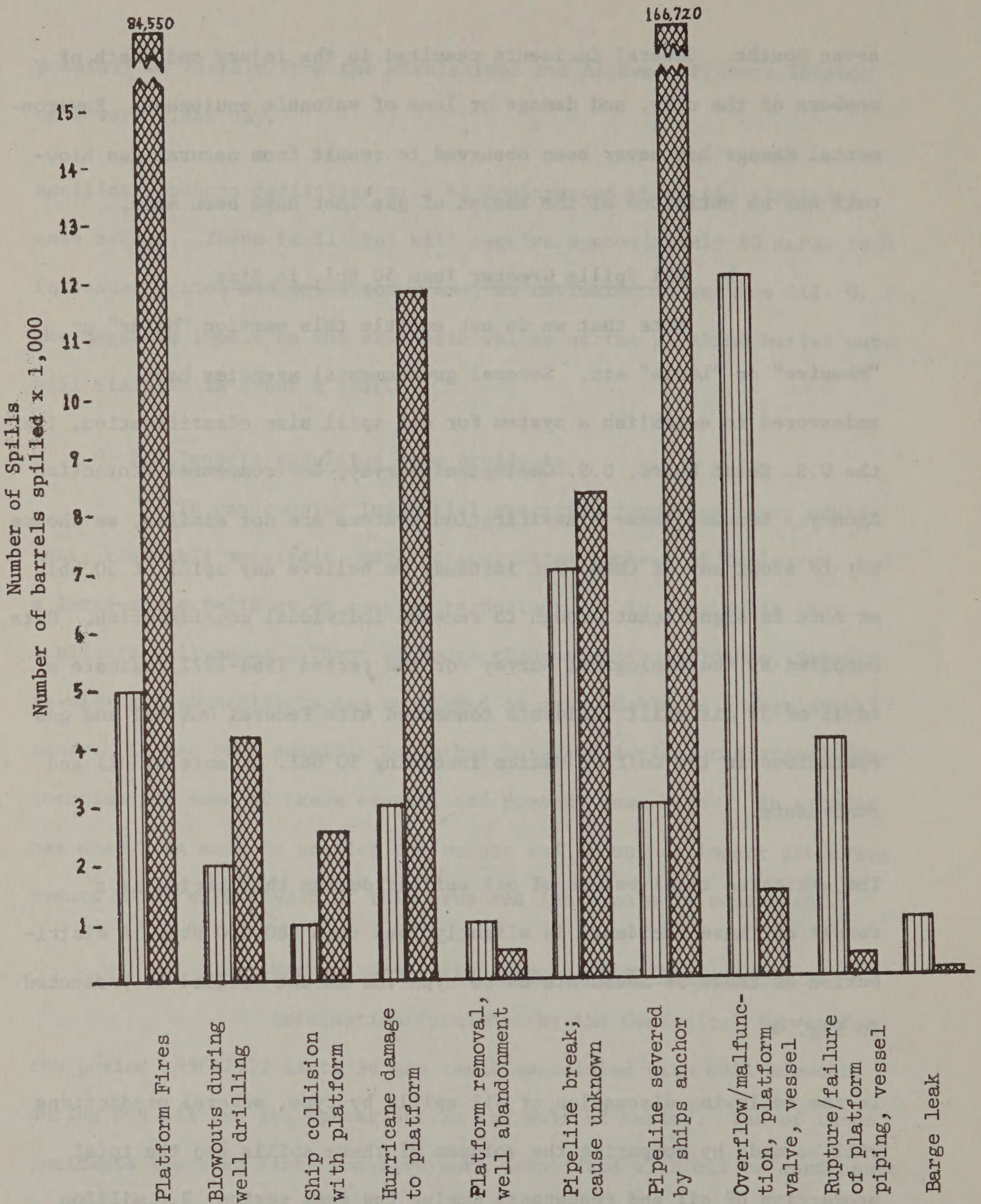

Figure 1. Oil Spills ≥ 50 bbl, Number and Amount (Data from Geological Survey.)

Number of Spills ||||||| Amount of oil spilled ▩

bbl. Although preliminary accident reports for this year indicate that several substantial oil spills have occurred, they are not included in the calculations because (a) we do not have data on total production during the same period, and (b) we assume that the spillage: production ratio will prove to be the same in most cases as in the past.

(1) Pipeline Accidents

During OCS operations, more oil has been spilled from pipeline accidents than from all other sources combined. In October of 1967, a vessel underway during a storm and with its anchor inadvertently left out, snagged and severed a pipeline about 20 miles west of the mouth of Southwest Pass, Mississippi River delta, Louisiana. The resulting spill went undetected for nearly two weeks, releasing over 160,000 bbl. of oil into the sea. In March of 1968, another anchor/pipeline accident resulted in a 6,000 bbl. spill. In February of 1969, a pipeline leak released over 7,500 bbl. into the sea; the cause was never determined.

Beginning in 1969, several actions were undertaken to decrease this inordinately high volume of spillage per accident and to keep the frequency of recurrence low. Since 1969, the Bureau of Land Management, through administrative procedures, has required the burial of all new common carrier pipelines with a minimum of three feet of cover out to a water depth of 200 feet. Where the pipelines cross shipping fairways and anchorage areas, they must be buried at least 10 feet deep. In water depths of less than 200 feet, only the lines in the gathering system between adjacent platforms of a particular oil or gas field may remain unburied. Permits to construct such lines are granted by the Geological Survey and the decision to bury is made on a case-by-case basis.

In connection with regulations formulated by the Office of Pipeline Safety (OPS), Department of Transportation (49 CFR Parts 192 and 195) offshore pipelines were required to be coated with tightly bonded, moisture impervious materials followed in many cases by a layer of dense concrete for mechanical and corrosion protection. In addition to coatings, impressed currents or sacrificial anodes were required to protect against electrolytic corrosion. OPS regulations also require continuous line pressure monitoring with some type of communication system (a built-in alarm or automatic shut-down system is normally used), and regular inspection of the pipeline route for leaks and other irregularities.

Other features used by industry also serve to mitigate against accidents: continuous metering systems, automatic high pressure shutdowns, and remotely controlled mainline block valves that can isolate sections of a line. A more complete discussion of all of these systems is presented in Vol. 1, Sec. I. F. 4. a.

Caution should be inserted at this point. In established oil and gas fields where older lines are present, corrosion will be in a more advanced state, the line may be poorly buried if at all, and all of the above-mentioned requirements for safety and control features may not apply. In fact, industry spokesmen have estimated that 48% of all pipeline leaks occur in lines that have been in use for 15 years or more.

With all of the above information in hand, it is our conclusion that leaks of the magnitude of thousands of barrels, such as those cited from 1967-69, could not occur from any lines resulting from this proposal, providing that existing regulations are stringently enforced and inspection procedures diligently followed. As evidence, we note that from 1970 to the present time, there have been four recorded pipeline leaks on the Gulf of Mexico OCS, resulting in a total spillage of 300 bbl. of oil.

For the purpose of predicting the rate and size of pipeline oil spills offshore that could result from this proposed lease sale we have made the following assumptions:

- All common carrier pipelines will be routed through corridors
- The industry will make a sincere effort to comply with existing codes and regulations
- There are no unforeseen geologic or other hazards which would lead to pipeline damage more often or severe than the levels experienced off Louisiana and Texas.

Based on these assumptions, we predict that not more than 200 bbl. per year will be spilled due to pipeline related accidents, and we predict that the maximum size of any one spill will not exceed 600 bbl.

The latest pipe-laying and monitoring techniques combined with modern materials and equipment should insure that the 460-800 miles of pipeline required for this sale suffer no major breaks for several years to come. Strictly on a judgment basis and with no reference to existing statistics it is estimated that pipeline breaks may range from zero in the early years to 3 incidents per year in later (±20) years.

(2) Oil Well Blowouts During Drilling

The control of imminent blowouts by increasing mud weight and activation of blowout preventers is discussed in Vol. 1, Sec. I. F. 2. a. In the event the control systems fail, however, the well will blowout of control, releasing large quantities of oil to the environment.

One example of a blowout during well drilling is the Santa Barbara incident.

SANTA BARBARA SPILL [1]

On January 28, 1969, a blowout occurred below Union Oil Company's fixed drilling Platform A in the Santa Barbara Channel, about six miles southeast of Santa Barbara, California. This blowout and spill occurred through a pre-existing fault in the ocean floor adjacent to the well after gas under high pressure from a deep reservoir was accidentally injected into shallow reservoir sands. The resulting build-up of pressure in the shallow reservoir sands soon exceeded the strength of the overlying rock layer and caused a rupture to occur. The rupture formed a fissure zone, thus opening an avenue of communication between the hydrocarbon reservoir and the seabottom (Reinhart, 1970).

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[1] Straughan and Kolpack (1971).

Total initial spillage was estimated by the Geological Survey to be 10,000 barrels, with subsequent leakage amounting to about 8,500 barrels. Other estimates of spillage range from 70,000 to 700,000 barrels. 1/

This is certainly a very tenuous base for statistics, but the numbers indicate one blowout per 2,860 wells drilled spilling an average of 2,100 barrels of oil per blowout. Using the average between the maximum and minimum number of wells estimated to be required (1,120-700) the probability for a polluting blowout occurring at all is $\frac{910}{2860}$ or 0.32. If there is no blowout, there is then of course, no oil spilled. Should a blowout occur, the volume of oil that might be spilled is impossible to estimate.

(3) Oil Spills Resulting from Platform Fires

Platform fires can be ignited by a variety of events. Most are undoubtedly caused by combustible hydrocarbon liquids or vapors being brought into contact with arcing electrical devices and overheated mechanical devices; more rarely they could be ignited by lightning or static electricity. Sometimes, platform fires first

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1/ Testimony of Dr. Carl H. Oppenheimer, OCS Public Hearing of August 23, 1972, New Orleans, Louisiana.

involve the accidental ignition of fuel, solvent, or heat exchange fluids. If caught soon enough, these small fires are usually controllable, but once a storage tank or well catches on fire, major structural damage occurs and adjacent producing wells on the platform may have their piping severed and also contribute to the fire. It is for this reason that we have chosen to group accidents of admittedly diverse causes under the heading "platform fires". By far, the vast majority of fires are extinguished quickly, before serious damage is done. But once a fire burns out of control, it usually leads to damage of the well heads and multiple well involvement. As was stated in Vol. 1, Sec. I. F. 3. c., downhole safety shut-in devices have a poor record of performance to date.

If producing wells are damaged in a way that allows them to flow freely and be ignited, they are usually allowed to burn while operations are underway to control the wild wells from a remote location. In this way, a high percentage of the hydrocarbon liquid expelled by the well is burned. This in turn results in less fire hazard from floating oil near control operations such as relief well drilling and in lower levels of ocean pollution. If a blowing well is releasing mostly or entirely natural gas, the possibility of ocean pollution is minimal. However, the safety of personnel and the security of the platform or drilling structure are imperiled should a fire occur. The decision whether or not to extinguish a gas fire depends on the circumstances of the moment. For example, it might be advisable to allow a gas well fire to burn while remedial action is being prepared if the structure and personnel are not in jeopardy. This would preclude accidental ignition while personnel were in the area of gas accumulation. The overall thrust, however, is to extinguish the fire quickly and bring the well under control.

An example of an apparently spontaneous platform fire which resulted in the ignition of several producing well and extensive damage to the platform is the Chevron Fire of 1970. 1/

On February 10, 1970, fire was observed on Platform "C" shortly after midnight from an adjacent platform. Platform "C" is located in 40 feet of water about 75 miles southeast of New Orleans, Louisiana. Field personnel boarded the burning platform but had to evacuate immediately because of the intense heat. During the following month, planning, construction and assembly of equipment for extinguishing the fire and controlling the anticipated oil spill was carried out. From March 10 through March 31, several methods were successfully used to control six of the seven wild wells on the platform (one well sanded up and plugged itself). These included dynamite, relief well drilling, wellhead repair, weighting and sealing chemicals, and activation of downhole safety valves.

Reliable estimates placed the total volume of oil spilled at about 30,000 barrels. Oil from the spill was a light crude, containing a high proportion of lower boiling constituents and a relatively low concentration (about 10%) of aromatic hydrocarbons. Through a fortunate set of circumstances, the oil was sprayed high into the air under great pressure and frequently into considerable wind, so that far more evaporation took place than usually occurs during a spill. Samples collected 500 feet from the platform and analyzed by Federal Water Quality Administration (FWQA) laboratories showed a loss in volume of 16%, all in the lighter ends. Also, about 5,000 barrels of oil were removed by skimming. Some 1,500 barrels of chemical emulsifier were used during the spill as well.

Accidents caused by human error during routine rework, maintenance and repair have resulted in at least two large spills of oil, along with destruction of platforms, the loss of a work vessel and several human lives. On May 28, 1970, renovation and repair work was being carried out on a platform in Galveston Block 189-L, offshore Texas. The platform had been shut-down and workmen were sand-blasting, painting, torch-cutting, and welding. When welding was attempted on a line leading to a storage tank containing 2,000 bbl. of crude oil, a series of explosions occurred, resulting in the death of five workmen and injuries to six. Burning oil spilled onto a nearby service boat, nearly destroying it, and about 100 bbl. also reached shore, polluting Galveston beaches. (National Transportation Safety Board, 1970)

The Bay Marchand Fire (Shell Fire and Spill) of 1970-71 was ignited as a result of human error. The plastic coating on the tubing of one well sloughed off and plugged the Tubing. During cleaning operations, workmen failed to close well control valves completely for a brief period while the well was left unattended. Plastic, used as a corrosion preventative in the tubing of well B-21, had sloughed off and lodged in the gate of the master valve. As the gate was closed, this plastic compressed, preventing complete closure of the valve, but giving an indication that the valve was closed. The well appeared to be shut-in, but after 30-40 minutes the plastic began to slip through the gate opening and was finally released, thus opening the well to the atmosphere and allowing oil to escape.

Falling debris and intense heat from the resulting ignition and fire damaged ten of the other 21 wells on the platform; thus 11 wells in all were contributing hydrocarbons to the fire. Four workmen died immediately and 36 were hospitalized. After five months the last blowing well was capped (Berry, 1972; Nelson, 1972). An undetermined amount of petroleum was consumed by the fire and 53,000 bbl. spilled into the sea. 1/

During the history of OCS production there have been many fires of varying sizes. Most have been extinguished before serious damage and pollution occurred. Of 81 recorded explosions and fires, only five have resulted in pollution of the sea by oil. However, the volume spilled, an estimated 84,550 bbl. is significant. Of even greater significance is the unfortunate injury of 120 men and death of an additional 59 (as listed in Geological Survey records).

1/ EPA estimates, based on remote sensing surveys, are about double the 53,000 bbl. estimate of the Geological Survey.

For the purpose of predicting platform fire-related pollution that could result from this proposal, the incompleteness of the existing data on number of producing oil wells and number of platforms requires that we consider instead, the relationship between pollution and total oil production. The following assumption is made:

- hazards leading to platform fires and technology used to control fires and blowing wells for the present proposal will not be significantly different from those present in operations in the western Gulf.

It is significant that OCS orders now require all new OCS completions (with shut-in tubing pressure less than 4,000 psig) to be protected with surface actuated subsurface safety devices, thus eliminating blowouts due to faulty and/or sand cut velocity-actuated downhole safety devices.

During the years 1964-72, total oil and condensate production from the OCS Gulf of Mexico amounted to about 2.6 billion bbl. During that same period Geological Survey accident records indicate 5 incidents of platform fire-related pollution resulting in a spillage of 84,550 bbl. This amounts to a spillage rate of 0.00325%. If we apply this to the maximum projected production rate for this proposal (up to 443,000 bbl./day or 161,695,000/year) we note that almost 5,300 bbl. per year of spillage may be predicted by this method of calculation. Based on the above assumption, we can conclude that the maximum size of a single spill in the future most probably would be limited to the volume of flammable material in storage on the platform at the time the fire started.

(4) Pollution Caused by Hurricanes

Whereas damage and subsequent pollution caused by the passing of a hurricane is not an accident in the strictest sense, lack of adequate preparation for the onslaught of a hurricane can be viewed as an avoidable "accident".

Accident records for the Gulf of Mexico OCS indicate that on October 3, 1964, a hurricane passed over the waters off central Louisiana and destroyed three platforms, resulting in the spillage of almost 11,900 bbl. of oil. All of the oil was lost from tanks on the platforms used to store produced oil prior to transshipment by barge.

Since 1964, three major hurricanes have hit the east half of offshore Louisiana where extensive offshore petroleum production takes place. While causing financial damage to the offshore oil industry, they have not resulted in major pollution incidents from operations in Federal waters, although smaller scale incidents have occurred. The threat of significant damage and major pollution incidents caused by hurricanes should not be discounted, however. The latest of these was Hurricane Camille. On August 17, 1969, she passed along the eastern flank of the Mississippi delta of Louisiana and into the Mississippi Gulf Coast. 1/ Camille's top winds were estimated at 201.5 miles per hour, and the barometric pressure in her calm eye dropped as low as 26.61 inches of

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1/ Corps of Engineers, Report on Hurricane Camille. Report No. 1338, 1970, U.S. Army Engineer District, New Orleans, Louisiana.

mercury. The hurricane surge at Pass Christian, Mississippi, was recorded at 22.6 feet above the normal level of the Gulf. Offshore installations in areas near South Pass, Main Pass, and Breton Sound were badly damaged. Prior to arrival of the storm, the Offshore Operators Committee advised tapering off production operations, and before the storm hit, 4,000 wells in state and Federal waters were shut-in and 3,000 workmen evacuated. Because of this caution, no injuries to petroleum production personnel were reported and there was a total absence of blowing wells and few leaking wells. The U.S. Geological Survey reported no oil slicks in Federal waters and only one in state waters.

During the onslaught of Camille, one production platform was destroyed and two were damaged, two drilling rigs were destroyed, and three were damaged. Also in the area were seven drilling rigs that were not damaged.

When the Weather Bureau advises that a hurricane or serious tropical storm is imminent, all oil and gas facilities in or adjacent to the path of the storm are evacuated. Upon evacuation. all surface equipment and wellhead controls are shut-in. In addition, blank tubing plugs are set in as many wells as possible to further reduce the possibility of pollution in the event the well is damaged. These tubing plugs form a seal against fluid flow.

Thus, it can be seen from accident records and industry performance that pollution due to hurricanes has resulted not from damaged and wild wells, but from platforms where the product transportation mode has been by barge. Because of the stipulation restricting barging of oil (Vol. 2, Sec. IV. D. 1.), we are certain that the level of barging due to development of tracts in this proposal will be no higher than that experienced in the western Gulf OCS (i.e., about 2-3% of all oil produced).

Based on the total oil and condensate produced during the years 1964-72, (2.6 billion bbl.), we note that 11,900 bbl. represents a spillage rate of 0.00046% due to hurricane damage. Projecting this rate to the maximum annual production rate projected for the proposed area, we note that almost 750 bbl. per year could be spilled during hurricanes. This prediction assumes the incidence of hurricanes to be uniform through the Gulf of Mexico OCS (i.e., about 1-3 per year). The maximum spillage from a single hurricane would depend on the extent of barging (and therefore, the number of platforms with large storage tanks) and volume of oil present in the tanks. With only one incident on record, no generalization can be made concerning the maximum spillage during a single hurricane.

(5) Accidental Spills from Overflow, Malfunction, Rupture or Failure of Platform Piping Valve or Vessel

This category of spills is essentially an extension of the "minor" spills, i.e., it includes those spills of the same origin as minor spills but consists of those that involved the loss of 50 bbl. or more before the condition was corrected. Accident records indicate a total of 16 such spills through 1972. Total spillage was 1,843 bbl, or an average of 115 bbl. per spill.

Assuming conditions leading to such spills will remain the same in the future, the spillage rate of 1,843 bbl. to 2.6 billion bbl. produced is 0.00007%. Projecting this to the maximum level of production for this proposal (161,695,000 bbl/yr), the predicted spillage is a little more than 100 bbl. per year. In the past, the maximum size of such a spill has been about 400 bbl.

(6) Accidental Spills Due to Ships Colliding With Platforms

To be considered here are spills that occur from platforms resulting from a collision by a commercial vessel. Spills of OCS produced oil from tankers and barges is considered in the next section (7). Consideration of vessel damage, platform damage, loss of life, and economic loss is included in subsection d., below.

In April of 1964, a freighter off central Louisiana struck and damaged a platform, resulting in a fire and the loss of 2,560 bbl. of oil into the sea. Accident records do not indicate a blowing well, therefore, the source of oil was probably a large storage tank, used to accumulate production for barge transshipment.

Again using data for spillage vs. production, we estimate that 160 bbl. per year could be spilled from accidents of this type. The maximum size of a single accident is difficult to predict. A history of one accident is obviously insufficient for generalization.

(7) Tanker and Tank Barge Accidents and Operations

Almost 36.5 million barrels of oil are released annually to the marine environment as a result of accidents, carelessness or mismanagement (Charter, et. al., 1973). Figure 2 shows the percentage of the total outflow from various polluting sources for the entire world oceans (Porricelli and Keith, in press). Figure 3 further breaks down the data on 269 polluting incidents which occurred in 1969 and 1970 involving tankers. This data puts into perspective the amount of pollution from tank barges and tankers, and shows, to some extent, the amount of spilled oil attributable to various types of tanker accidents.

In 1971 the United States tanker fleet carried 5.5%, or 71 million metric tons, of all waterborne petroleum in the world. In the same year, they were responsible for discharge of 55,000 m tons of oil into the marine environment which means that on the average .08% of each cargo was spilled as a result of tanker casualties and operations. Porricelli (1969) states that .03% of each cargo carried by U.S. tank barges is spilled into the environment each year as a result of mishaps and operations. These two figures can be used to calculate the potential amount of oil from this proposed lease sale that will reach the marine environment as a result of tanker and tank barge movement of oil.

Earlier in this statement (Vol. 1, Sec. I. F. 4. d.) we noted that industry anticipates barging operations from, at most, two areas of those included in the proposed lease sale (Pensacola South No. 1 and

Figure 2. Sources of Oil Pollution to the Oceans from Porricelli and Keith, in press

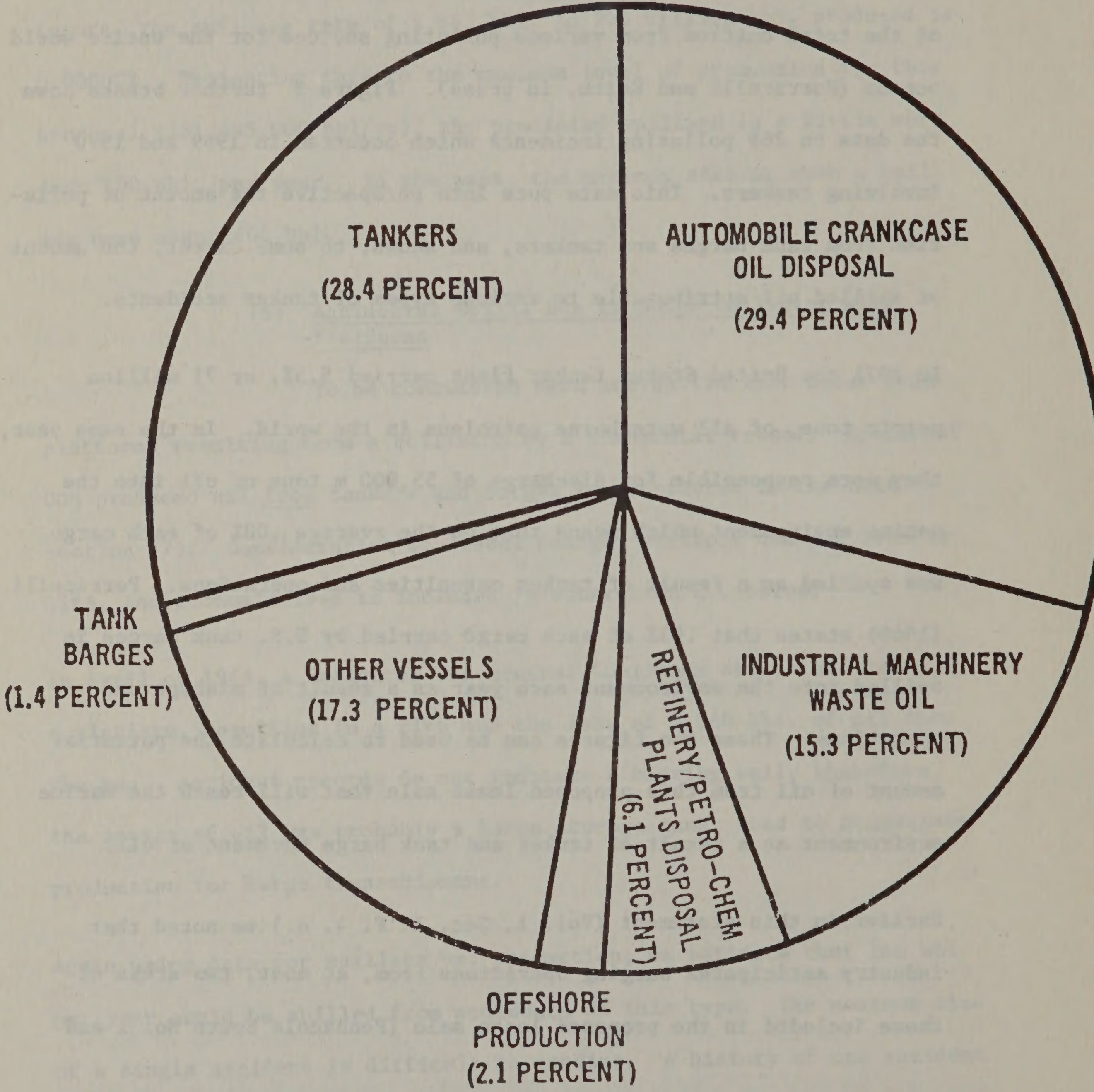
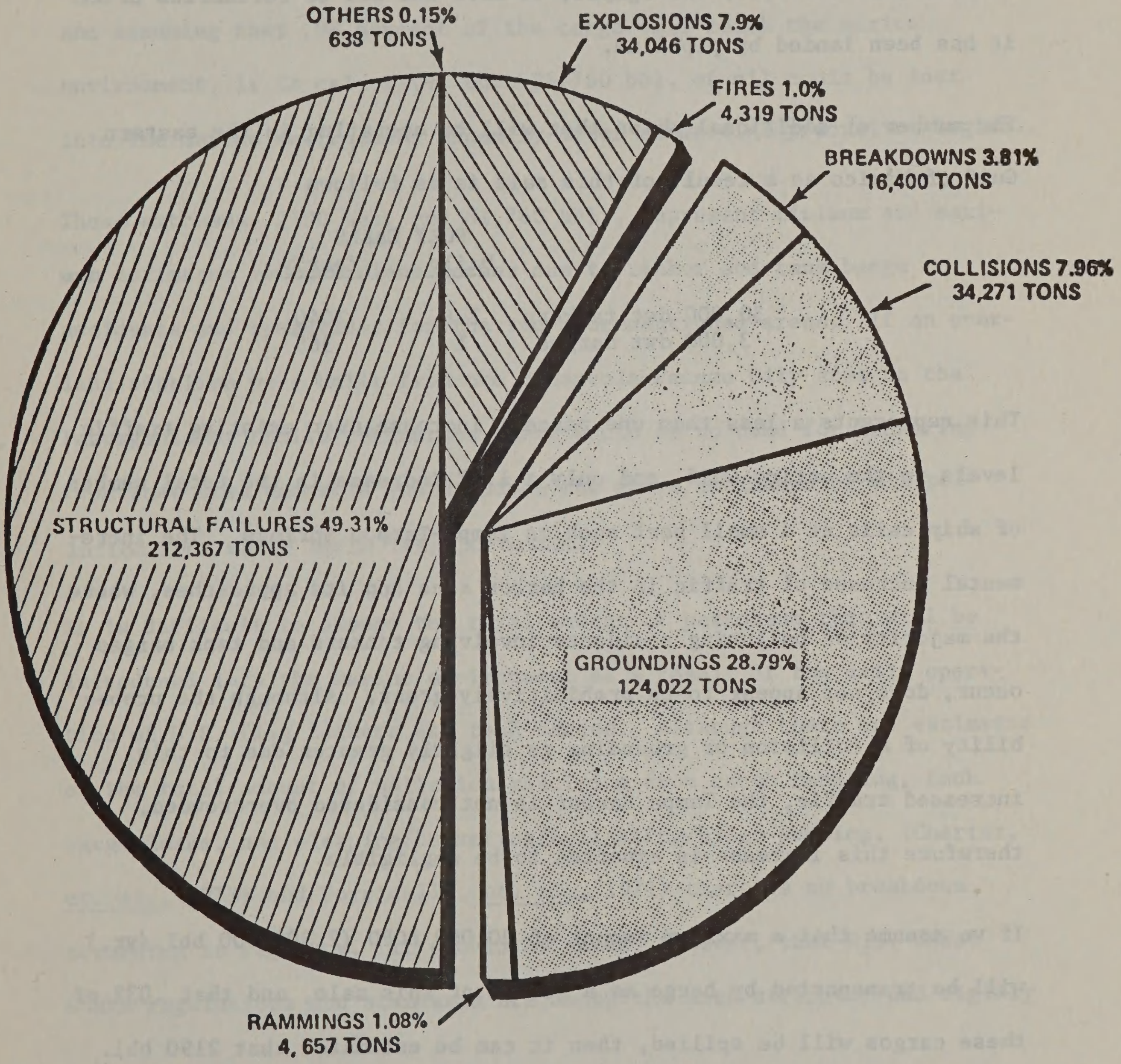


Figure 3 1969-1970 Tanker Polluting Incidents, Percentage Oil Outflow by Type of Accident from Porricelli and Keith, in press



Tampa-Tarpon Springs-Appalachicola Areas). This is contingent upon the fact that production in each of these areas does not exceed 10,000 bbl. If it does a pipeline will be laid to transport the crude oil shoreward. They also foresee two possible tanker terminals, each with a 140,000 BOPD (102,200,000 bbl./yr.) throughput, to move the oil to refineries after it has been landed by pipeline.

The number of additional ships that will be operating in the eastern Gulf of Mexico as a result of this sale is as follows:

	PORT CALLS	
	Daily	Yearly
30,000 dwt tankers	2.8	1040
3,000 dwt barges	1	365

This represents a less than one percent increase over existing traffic levels in the entire Gulf, and only a 1.6% increase in the total number of ship calls at a small port such as Tampa-Tarpon Springs. The incremental increase of traffic in the harbor area and its approaches, where the majority of polluting accidents involving tankers and tank barges occur, does not appear to be prohibitively great. Although the probability of a collision or grounding is slightly greater due to this increased traffic, the Tampa Harbor is not considered overcrowded, therefore this increase is expected to be negligible.

If we assume that a maximum amount of 20,000 BOPD (7,300,000 bbl./yr.) will be transported by barge as a result of this sale, and that .03% of these cargos will be spilled, then it can be estimated that 2190 bbl.

of petroleum will be annually introduced into the marine environment from tank barges. This would not be a problem until approximately the fourth year after exploration began.

Using the maximum of two 140,000 BOPD tanker terminals as an estimate, and assuming that .08 percent of the cargo will reach the marine environment, it is calculated that 81,760 bbl. of oil could be lost into the marine environment annually after commercial production begins.

These extremes, 2190 bbl. and 81,760 bbl., represent minimum and maximum estimates for petroleum losses due to tanker and tank barge accidents and operations for the two aforementioned areas. If an overland pipeline were built from the Pensacola-Panama City area to the Pascagoula or Mobile refineries there would be no need for tankering from that area and this would reduce the above estimates of oil pollution from water borne transportation.

It is difficult to assess the total amount of petroleum that will be introduced into the marine environment as a result of the daily operation of U.S. flag tankers and tank barges. Although there are estimates of the total amount of pollution resulting from cargo handling, tank barge leaks, and cleaning/bunkering/ballasting/bilge pumping, (Charter, et. al., 1973; and Porricelli, et. al., 1971) there is no breakdown according to registry. It should be noted, however, that U.S. Coast Guard regulations and standards are among the most stringent and rigidly enforced in the world. This would result in a considerably lower outflow figure than is reported for the entire world fleet, vis-a-vis the very low .88% outflow of petroleum from U.S. flag vessels as a result of accidents.

Several models have been used in the Trans-Alaska Pipeline System Environmental Statement to predict the range of frequencies for tanker casualty. One of these models, originally suggested by Porricelli, et. al., (1972), will be used here, even though it considers casualties on a world-wide basis. Porricelli et. al. have estimated that 0.0009 grounding or collision caused pollution incidents occur for every portcall, or one incident per 1,110 portcalls.

Applying this to our situation, 2.8 portcalls/day x 365 days/yr. x 0.0009 casualties/portcall == 0.92, or about 1 casualty per year.

No analysis was found which would allow us to predict the frequency of tank barge casualties.

(8) Other Spills of 50 Barrels or More

Just two recorded spills remain which do not fit into the categories used in the preceeding subsections.

In June, 1965, during well abandonment and platform removal, a well break resulted in a spill of 500 bbl. We hesitate to predict that such an accident will happen again. OCS Operating Order No. 3, issued in 1969, requires that a redundant series of bridging devices, weighted muds, and cement plugs be placed in any well or drill hole prior to abandonment. We believe that well or hole abandonment performed in this manner provides an ample margin of protection against any possible communication between subsurface oil bearing formations and the atmosphere.

In July of 1971, damage to an oil storage barge caused a leak which spilled 100 bbl. of oil into the sea before the cargo could be offloaded into another barge. It is very likely that oil will be spilled from barges in the future. This possibility, and a prediction of volumes that may be spilled are discussed in detail in the preceeding sub-section (7).

c. Minor Spills

The requirement for reporting minor spills (less than 50 bbl.) and slicks of unknown origin was put into effect in 1969. From 1970, the first full year of minor spill records, to the present, the number of minor spills reported has remained almost constant, but the total volume of spills has decreased each year. The following table (Table 4), furnished by the Geological Survey, lists annual totals of minor spills by number, volume, and source, and also lists numbers of slicks sighted.

Table 4 MINOR OIL SPILLS

Year	Total Number Reported	Source by Number		Total Volume (Bbl.)	No. Oil Slicks Sighted, Not Ident. by Source
		Drilling	Prod. & Trans.		
1970	1,200	4	1,196	2,597	745
1971	1,250	13	1,237	2,414	878
1972	1,158	13	1,145	1,812	606
1973 to 2nd qtr.	554	3	551	923	380

Oil slicks from unidentified sources are not positively related to offshore drilling, transportation, or production. There is evidence of natural oil seepage in the Gulf of Mexico, first recorded in 1906, long before oil development activities were initiated, and seepage still persists in oil prone areas. It is possible that these natural seeps could be the source of some slicks classified as being from an "unidentified source". Other possibilities are ships bilges and tanker cleanings.

We are optimistic about the industry's performance in cleaning up its routine operations and decreasing the amount of chronic spillage. The trend becomes obvious when total minor spills in barrels per month are plotted against time, as has been done in Figure 4. The bold, dashed line represents a linear regression of the data. During the period 1970-72, total oil and condensate production varied by less than 13%, whereas the regression line represents a decrease in minor spill volume of over 40%.

If a total of 6,823 bbl. of petroleum liquids were spilled during the years 1970-72, and 1,113,306,610 bbl. were produced during the same period, the spillage rate was 0.000613%. Projecting this rate to the present proposal, where maximum production is estimated at 161,645,000 bbl./yr., it seems valid to predict a maximum minor spill level at about 1,000 bbl./yr. If the downward trend of minor spill volumes, as shown in Fig. 4, continues, the figure will be somewhat smaller. By definition, the maximum size of a single minor spill, of course, is less than 50 bbl.

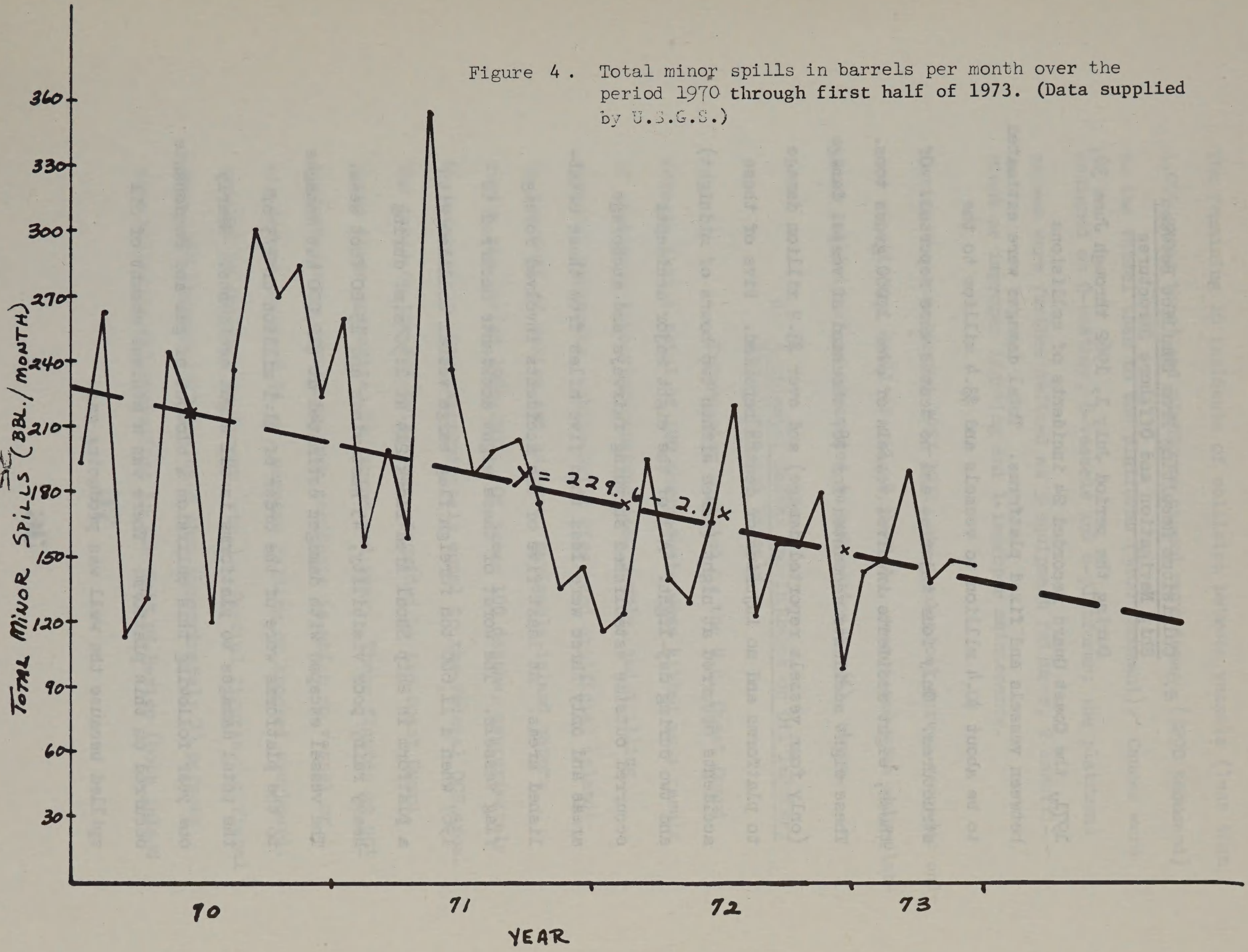


Figure 4. Total minor spills in barrels per month over the period 1970 through first half of 1973. (Data supplied by U.S.G.S.)

d. Collisions Resulting From Conflict Between Ship Navigation and Offshore Structures

During the period July 1, 1962 through June 30, 1971, the Coast Guard recorded 24 incidents of collisions between vessels and fixed platforms. Total damages were estimated to be about $0.4 million to vessels and $3.4 million to the structures. Only four injuries and no deaths were reported. Of these, eight accidents involved vessels of over 1,000 gross tons. These eight accidents accounted for $87 thousand of vessel damage (only four vessels reported damage) and over $3.2 million damage to platforms and no injuries or deaths reported. Five of these accidents occurred at night (three within two hours of midnight) and two during day-light. All of the eight major accidents occurred outside established shipping fairways and anchorage areas and only three were less than five miles from these established areas. At least five of the accidents involved foreign flag vessels. The worst of these eight accidents occurred in 1967 when a 11,600 ton foreign flag cargo vessel collided with a platform in Ship Shoal Area Block 214 at 1:30 a.m. during heavy rain, poor visibility, 45 knot winds and 15-20 foot seas. The vessel escaped with damages estimated at $12,000 but damages to the platforms were of the order of $1.1 million or 1/3 of the total damages to platforms in all eight accidents. Nearly one year following this collision a blowout of gas and condensate occurred on this platform. There was a minimal amount of oil spilled because the well was producing gas.

The remaining 16 incidents of collision between vessels (less than 1,000 gross tons) and platforms caused more damage ($290 thousand) to the vessel than to the platforms ($100 thousand). Causes were assigned as 2-weather, 8-vessels and 6-platforms; the platforms causes were further defined as 3-equipment failures, 2-insufficient or improper lighting and 1-improper maintenance.

During the time period 1957-1971, the Geological Survey recorded only one significant spill of oil, 2,560 bbl., associated with ship-platform collisions, as discussed in subsection b. (6), above.

e. Accidental Deaths and Injuries on Oil Industry Structures and Vessels

Information supplied by the U.S. Coast Guard reveals that a total of 100 individuals were killed as a result of accidents involving construction, supply, and drilling vessels, workboats, mobile drill rigs, and artificial islands in the Gulf of Mexico and adjacent navigable inland waters during the period 1964-1972. Of these 100 deaths, approximately 66 occurred in water approximately equal to the Federal OCS area. The table on the following page, provided by the Coast Guard, shows these casualties by source and year. These figures do not include deaths resulting from accidents in which no vessel or rig damage occurred (i.e., persons falling or knocked overboard, crushed by drilling equipment, etc.). Partial figures for fiscal year 1967 through 1972 indicate that approximately 35 persons were killed in oil operations in the Gulf of Mexico (both inland

Table 5. Total Deaths Reported as Resulting from Vessel Casualty

	Inland Waters Gulf of Mexico									Gulf of Mexico								
	Fiscal Years																	
	64	65	66	67	68	69	70	71	72	64	65	66	67	68	69	70	71	72
Mobile Drill Rigs and Artificial Islands	No info		-	7	-	12	-	-	-	No info		-	-	2	1	7	14	6
Oil Industry Supply Vessels and Workboats	-	-	-	-	-	-	3	2	-	-	-	2	-	-	-	-	4	-
Oil Industry Construction and Drilling Vessels	4	1	2	1	-	2	-	-	-	22	1	-	1	-	-	2	3	-
Sub Total	4	1	2	8	-	14	3	2	0	23	1	2	1	2	1	9	21	6

Total 100

and international waters) with no casualty to the vessel being involved.

Based on the years 1967-72, the death rate due to offshore oil operations and involving vessel damage in international waters was 40 and in inland waters was 27. Distributing the 35 deaths not involving vessel damage according to the 40:27 ratio, an additional 24 deaths may be added to the total for international waters, giving a total of 64 deaths for the six year period. Based upon this information, at least ten deaths per year may be expected in the Gulf of Mexico as a result of offshore oil industry activity in OCS waters.

Below is listed a summary of injuries reported to the Office of Workmen's Compensation Programs under the Outer Continental Shelf Lands Act by district [1]. The years are recorded as Fiscal years.

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[1] U. S. Dept. Labor.

All Districts

Fiscal Year	Cases Reported Non Fatal	Fatal	Total
1968	3,583	28	3,611
1969	3,395	25	3,420
1970	3,261	21	3,282
1971	2,822	32	2,854
1972	1,975	14	1,989
1973	2,307	21	2,328

3. Impacts Which Can be Minimized or Avoided by Regulations and Safe Operating Practices

A more thorough discussion of regulations and operating orders is presented in section IV, "Mitigating Measures Included in the Proposed Action."

4. Summary of Impacts

The preceeding sections describe the source and amount of both intentional and unintentional discharges which will pollute the sea and ocean floor if this proposed lease sale is held. It is the intent of this section to summarize all predicted polluting discharges in tabular form (Table 6). Two features should be pointed out prior to consideration of the tabular values.

(1) All pollution sources will not be present throughout the life of the leases; e.g., exploratory drilling will be completed within 4 years of leasing, developmental drilling within 7, and production will not begin until the third. The reader is reminded of the timetable and discussion in Vol. 1, Sec. I. F. 6.

(2) The text of the preceeding sections contains estimates of maximum pollution anticipated based on the maximum number of wells and amount of production. The table included here shows a range of pollution anticipated, based on the range of production predicted by the Geological Survey (270,000-443,000 bbl. of oil per day or 98.550 million - 161.695 million bbl. per year).

Table 6. PREDICTED POLLUTION FROM DEVELOPMENT AND OPERATION OF OIL AND GAS LEASES OCS SALE #32

Pollution Source	Pollutant	Duration	No. Incidents		Volumes		Units
			Low	High	Low	High	
Well Drilling	Drill Cuttings	Exploratory - 0-4th year Development 3-7th year	700 (wells)	1200	486,500	1,063,000	tons
Well Drilling	Mud Chemicals	Same as above	700 (wells)	1200	56,000	103,000	tons
Total drill cuttings and mud chemicals discharged into sea					542,500	1,116,000	tons
Produced Formation Water	Brine/Oil	3rd yr - life			1/		
Pipeline Leaks	Oil	3rd yr - life	0	3/yr	0	200	bbl/yr
Blowouts (Drilling)	Oil	0 -7th yr	0	1	0	2/	bbl
Platform Fires & Explosions	Oil	3rd yr - life	0	1/yr	0	5,300	bbl/incident
Hurricane Damage	Oil	3rd yr - life	1/yr	3/yr	450	750	bbl/yr
Equipment Failure/ Human Error	Oil	3rd yr - life	2/yr	5/yr	70	100	bbl/yr
Ship Collision	Oil	Life	0	1/yr	0	160	bbl/yr
Barging Operations	Oil	3rd yr - life			2200 3/		bbl/yr
Tanker Operations	Oil	3rd yr - life	1 3/		81,800 3/		bbl/yr
Minor Spill (50 bbl)	Oil	Life	100/yr	150/yr	600	1,000	bbl/yr
Maximum amount oil which could be spilled into sea					91,510 4/		

1/ Insufficient geologic data - No prediction

2/ Too many factors involved to make meaningful prediction. No "annual" volumes concerned. One "Blowout".

3/ Method of calculation does not allow for prediction high and low volumes.

4/ Does not include oil associated with formation water; represents peak of production, not developmental or declining years.

B. Impact on the Living Component of the Environment

OIL SPILLS

The most severe impacts on the communities of the marine and coastal ecosystems of the eastern Gulf of Mexico will surely prove to be those resulting from spilled oil. It is important at the start, however, to point out that the prediction of effect at the community, even population, level has little basis in the existing literature. No studies, aimed at determining the effect of spilled crude oil at the community level, has as yet been accomplished in the Gulf of Mexico. Studies which encompass effects at the community level are unfortunately far removed and not closely related to conditions in the Gulf. These latter studies include the commendable efforts of the scientists at Woods Hole in their study of the spill at West Falmouth, but the material spilled here was No. 2 fuel oil, generally conceded to be far more toxic than most crudes. Also included are the studies at Santa Barbara and at Milford Haven and Cornwall England, involving various combinations of high energy beaches, natural beach erosion, rocky intertidal zones, large tidal ranges, natural oil seeps, pesticides and large quantities of emulsifiers--very few of which are exactly duplicated in the Gulf of Mexico.

The larger proportion of oil effects studies have been devoted to small groups or a single species, involving either an accidental spill, a controlled oiling, or a laboratory aquarium, and the results are applicable to the cellular or organism level.

Thus, in this Final Environmental Statement, predictions of impact must be based on diverse and mostly unrelated sources of information of which very few are from the Gulf of Mexico, and conclusions must, in part, be subject or avoided. We are not content with this level of knowledge of the effects of spilled oil and have included as part of this proposal, plans to study and determine the effects oil produced in the northeastern Gulf will have on offshore and shoreline habitat and organisms. (See Vol. 1, Sec. I. H. 5.)

In preparation of the Georges Bank Petroleum Study, MIT's Offshore Oil Task Group (1973) identified several pathways by which crude oils can exert a damaging effect on plants and animals.

a) any disruption at or below cellular level is considered as a cellular effect

b) any disruption above the cellular level dealing with biochemical processes is considered to be a physiological effect

c) any disruption of instinctive and/or voluntary control is considered to be a behavioral effect.

They then defined five responses which are ellicited by these three effects:

(1) lethal toxicity,

(2) sub-lethal disruption of physiological or behavioral activities,

(3) the effects of a direct coating by oil,

(4) incorporation of hydrocarbons in organisms which cause tainting and/or accumulation of hydrocarbon in food chains; and

(5) changes in biological habitats.

We have taken these definitions and applied them to three broad categories of spills and ecosystems in the table below (Table 7).

PIPELINE BURIAL, DRILLING MUD AND CUTTINGS DISCHARGE

No attempt has ever been made to determine the effects of these operations on the marine and coastal ecosystems in the Gulf of Mexico, and to our knowledge, anywhere in the world. In response to this utter dearth of information, we have included as part of this lease sale proposal, extensive studies of these operations, beginning with base line data gathering prior to any industry activity and effects studies during the operations (see Vol. 1, Sec. I. H. 5.).

It can be assumed that the effects of pipeline burial in offshore areas and wetlands will be qualitatively similar to those ascribed to channel and shell dredging, but not as severe because:

(a) the physical dimensions of the excavation are several times smaller

(b) no spoil deposits or permanent channels will be left in shallow areas or wetlands, and hence, natural circulation patterns will not be permanently altered.

It is tentatively assumed that the effects of drilling muds and cuttings discharges are also related to those of dredging, specifically, turbidity, and smothering. We have been unable to determine that any of the components remaining in that portion of drilling muds that are discharged are capable of exerting toxic effects on marine life. As far as we can

Table 7

Source	Lethal Toxicity	Sublethal Effects	Coating With Weathered Oil	Incorporation of Hydrocarbons into Food Webs	Changes in Habitat
Massive Oil Spill	Open Gulf Shoreline Estuary/ Wetland	Open Gulf Shoreline Estuary/ Wetland	Shoreline Estuary/ Wetland	Open Gulf Shoreline Estuary/ Wetland	Shoreline Estuary/ Wetland
Small Oil Spill	Shoreline Estuary/ Wetland	Shoreline Estuary/ Wetland	Estuary/ Wetland	Estuary/ Wetland	
Chronic Dis-Charges and Minor Spills	Shoreline Estuary/ Wetland	Open Gulf Shoreline Estuary/ Wetland	Shoreline Estuary/ Wetland	Shoreline Estuary/ Wetland	Shoreline Estuary/ Wetland

Explanation of Terms:

Massive Oil Spill: Several hundreds to thousands of barrels
Small Oil: Fifty to a few hundred barrels
Chronic Discharges and Minor Spills: Amounts small but very frequent or continuous
Lethal Toxicity: Interrupts physiological processes at cellular or organ level
Sublethal Effects: Adverse effects on physiology of growth and reproduction and on instinctive and voluntary behavior
Coating with Weathered Oil: Large patches of tarry material which has already lost much of its toxicity due to biochemical oxidation, vaporization
Changes in Habitat: Lasting for several years, longer than the spill/ clean-up period.
Shoreline: Intertidal to exposed beach; not including estuaries, bordering wetlands.

determine only one heavy metal, chromium, is present in the discharged muds, and this at a concentration of about 12 ppt at the time of discharge, before dilution and dispersion in the sea.

In general the effects of pipeline burial and drilling mud and cutting discharges are:

a) dredging nearshore areas where land pollution has occurred for many years, numerous pollutants will be resuspended in the water column. These may include organic maters which will increase BOD and decrease dissolved oxygen, toxic heavy metals and pesticides which may again exert their toxic effect before gradually being reincorporated into the sediments.

b) dredging in areas of hard bottoms, where biotic communities have evolved to take advantage of such conditions and are adapted for attachment to a hard substrate (sponges, soft and hard corals, seaweeds, sessile molluscs), will eliminate suitable sites for attachment through the path of the operation either permanently or until the substrate can gradually become compacted again, on the order of at least several years.

c) both pipeline burial and mud/cutting discharges will produce a smothering effect on the burrowing and attached benthos where the material gradually settles as a layer of significant thickness.

d) increased turbidity will occur at all marine sites where pipeline burial and mud/cutting discharges takes place. The fine inorganic particles causing the turbidity can clog the respiratory organs and filter-feeding mechanisms of many marine forms.

e) pipeline burial in coastal wetlands and uplands will displace many species of wildlife during operations due to noise pollution and the physical presence of construction machinery. The effects of pipeline burial in wetlands can have a substantial impact of one to several years duration through devegetation and disruption of substrate.

OTHER IMPACTS

Still significant, but probably less environmentally damaging impacts result from the discharge of produced formation waters into the sea and onshore habitat removal by pipeline terminals and ancillary facilities.

1. Impact on the Open Gulf: Pelagic Marine Life and Oceanic Birds

a. Impact on the Plankton

Impacts that may be anticipated to have an effect on plankton will result from accidental spills of oil, discharge of drilling fluids, and formation waters, and burial of pipelines.

After an oil spill has occurred from a tanker or platform, that which has not evaporated, been carried ashore, or cleaned up will float at the surface for a time and eventually be dispersed as minute droplets in the water. In addition, certain components of crude oil are slightly soluble in seawater. In the two latter phases the oil has the opportunity to damage marine plankton and enter the marine food chain.

Hufford (1971) notes laboratory studies which indicate oil can affect phytoplankton at the cellular level after several days exposure. He cites laboratory experiments in which oil products in sea water cause lack of cellular division and death in phytoplankton. Apparently, cellular membrances were damaged by the penetration of hydrocarbons and this led to the extrusion of the cellular contents. The MIT Offshore Oil Task Group (1973) had concluded after an extensive literature survey that phytoplankton sensitivities vary over a wide range, that a few species are apparently sensitive to concentrations of soluble aromatic derivatives of crude oil as low as 1 ppm. However, most species are unharmed by concentrations of 100 ppm or higher. In relation to oil in formation water discharges, the MIT Group noted that under likely assumptions with respect to aromatics content of the oil, mixing depth and dispersion co-efficient, the area in excess of the lower concentration threshold of effect on the most sensitive phytoplankton would be limited to a circle whose radius is about 40 feet. We presume the effect would be similar for all chronic low-level leaks and discharges from platforms and tankers.

At the population level, Oguri and Kanter (1971), studing the effects of the Santa Barbara spill, found no conclusive evidence of a decrease in phytoplankton productivity that could be attributed directly to the oil spill. Individual experiments indicated, however, that the use of dispersants may have resulted in marked reductions in productivity.

They theorized that the longevity of any such effect would depend on the currents and rate of dilution, as well as the type and quality of the dispersant. No evidence was found in the literature that spilled oil enters the marine food chain via adsorption or absorption by phytoplankton and subsequent ingestion by grazing herbivores.

Little information has been found concerning the effect of crude oil on the zooplankton. At the organism level, Hufford (1971) cites one experiment which showed accelerated death of zooplankton exposed to diesel oil (0.1% for 5 to 60 minutes) as compared to non-exposed zooplankton. Many members of the zooplankton community are eggs and larvae of benthic and nektonic adults. The results of numerous studies have shown that larval forms may be 10 to 100 times more sensitive than their adult counterparts (Kuhnhold, 1970, cited by MIT, 1973).

The impacts of oil in formation waters and from other chronic, low-level spills would not likely be measureable at the population level. However, the effects of a massive oil spill would probably result in short-term perturbations. The MIT Group (op. cit.) has noted that virtually all of the threatened organisms are members of populations that have reproductive patterns based on expected high egg-larval-juvenile mortality. In addition, most species have reproductive periods of 100 days or more, creating very high replacement rates for any individuals that are killed, whether by predation, oil spills, or other causes.

At the community level, food chain contamination is an important possibility. Zooplankton have been observed to ingest spilled Bunker C oil particles, however, with no apparent effect. Members of the Operation Oil (1970) task force, studying the effects of spilled Bunker C from the tanker Arrow in Chedubucto Bay, Nova Scotia, observed that many copepods in the area had apparently ingested small oil particles and 2.4% Bunker C was found in the feces of one species. They noted that animals containing smaller oil particles voided these within 24 hours and showed no signs of distress. That they continue normal activities with no apparent harm is quite important in consideration of the marine food chain, because they can be eaten by small fishes and filter-feeder organisms while carrying the oil in the gut. These in turn may be eaten by large predatory animals and thus all conditions are present for a classic example of biological magnification of a potentially harmful or toxic compound.

The discharge of drilling muds and drill cuttings, and the pipeline burial operation will produce increased turbidity in the surrounding water. The MIT Offshore Oil Task Group (op. cit.) notes that such localized changes in water quality could have some detrimental effect on plankton caught in the discharge plume. Phytoplankton activity would be reduced due to attenuation of light penetration, and filter feeding zooplankton may be adversely affected because of abnormally high concentrations of suspended sediments. Due to the very localized nature of drilling mud discharges, the MIT Group expects no impact on populations and higher levels of organization. We expect the same conclusion would apply to offshore pipeline burial except for one case.

Industry plans now call for bringing ashore one gas pipeline in Taylor County, Florida. If the pipeline right-of-way passed through the outfall of theFenholloway River, a very polluted river, a large amount of organic material in the sediment will be resuspended into the water, causing an increase in biochemical oxygen demand and a resultant lowering in dissolved oxygen. Since the source of pollution is mainly paper mill waste, the sediments could also contain mercury. We presume the State of Florida would work with the industry in selecting a pipeline route which would avoid this potential impact.

The regular discharge of formation waters, "oil field brines", could have a local impact on the plankton. It has been conjectured that the brines also could serve as a "fertilizer" in shallow seas and might trigger a red tide.

Although the water is put through a polishing facility and has all but traces of entrained oil removed, it may contain a heavy concentration of dissolved salts 1/ and is devoid of dissolved oxygen. It could be anticipated that the release of this water would result in a plume trailing away from the point of discharge in the direction of the current with a core of perhaps a few feet in diameter and tens of feet in length that would be harmful or lethal to the plankton. At the cellular level, physiological stress would probably result from an osmotic imbalance

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1/ An average 141,473 mg/l was found in the examination of over 80 examples of formation water taken from South Louisiana and the OCS. This value may be compared to the world average of 35,000 mg/l for natural seawater.

(cells losing water to surrounding brine) and low dissolved oxygen leading to suffocation. It is doubtful that the impact would be felt at the population level, however. Beyond the zone of stress, however, one author has actually noted a zone of stimulation or fertilization during a study of brine discharge in Galveston Bay (Mackin, 1971).

Ingle and Martin (1971) have attempted to define the environment in which red tide outbreaks occur. They noted from earlier literature that no significant correlations could be found between the increase of the causative organisms in a given period and typical parameters (alkalinity, inorganic and total phosphorus, nitrate and nitrite nitrogen, calcium, copper, total organic nitrogen, or ammonia nitrogen). There is a rough correlation with other other environmental factors, including salinity, temperature, onshore winds greater than 7 knots, and the existing population levels of the causative organism.

Ingle and Martin (ibid.) noted that iron concentration and specification in association with organic chelating agents such as tannic acid, and humic acid are most significant in causing a red tide. In their formulation of a "critical iron index" correlation, they predicted a red tide outbreak near Charlotte Harbor, Florida, following the delivery to the ocean of 235,000 pounds of iron by the Peace River, assuming optimum temperatures of 16-27° C. and assuming an absence of a hurricane or very high winds within 150 miles of the harbor.

We cannot predict the quantity of brines, nor their iron content, which may be discharged from tracts proposed for leasing. We further note from Steidinger (1973) that iron, per se, has not been pinpointed as "the" triggering factor, yet it appears to be a suitable predictive index because it possibly coincides with other trace elements or chelators discharged via land runoff after heavy rains. Therefore, we cannot draw conclusions as to whether the discharge of formation waters could trigger a red tide.

After consideration of the above information our conclusions concerning the impacts on plankton of the open Gulf are as follows:

1) The effects of pipeline burial, drilling mud/cuttings discharges and chronic minor spills on the plankton will be localized and will be immeasurably small at the population level.
2) The deleterious effects of formation water discharge will also be immeasurable small at the population level; however, the possibility of these brines triggering a red tide has been raised.
3) A massive oil spill is thought to be capable of producing significant perturbations in plankton populations. The mode of recovery has been discussed.

b. Impact on the Neuston

The strict definition of neuston includes all organisms swimming or floating at the surface of the water. We are unfamiliar with all members of the Gulf neuston, but include here, because of significance and convenience, the surface-floating Sargassum community and the eggs of several ecological and commercial important fish species, which are boyyant.

Spooner (1969) notes that plankton collections following Torrey Canyon showed damage to minute plant cells of the order Prasinophyceae which float at the surface; pilchard eggs, which also float, showed a high proportion dead and there was a local shortage of pilchard larvae. She is unaware whether this damage was done by oil alone or by oil and emulsifiers, which had been used to disperse the oil.

In the Gulf, the Mackerels and some of the clupeids are among those with bouyant eggs. Usually these species, like the plankton mentioned in the previous section, produce enough young to allow for large-scale replacement due to predation and other causes of mortality. In some years there is a substantial decline in menhaden and other fisheries, indicating a decrease in the population. Although the cause is never determined, it is often thought to result from abnormal weather, Mississippi River floods, and other reaons. If a large spill occurred in a sensitive area simultaneously with other adverse environmental conditions, it is conceivable that the synergism of the two events could surpress the fish population further. This situation is hypothetical however, and has no basis in the existing literature about the effects of oil spills.

Especially in Florida waters, the floating Sargassum and its community would be damaged by floating oil. In mature states, this seaweed, along with broken blades of seagrasses, can form large floating mats, patches or long windrows. This is a very rich community including a large aufwuchs (living attached to, or gliding upon) component, and a rich plankton component. In addition, many juveniles of fish, squid, and other nektonic forms are associated with the floating masses (LaRoe, 1972). It is conceivable that a heavy oiling of the Sargassum would cause it to adhere and form tight mats or clumps and would result in complete destruction of the community.

Summarizing the potential impacts on neuston:

1) Although there is no factual evidence in the existing literature it is conceivable that a massive oil spill could work in synergism with other adverse conditions to produce a decrease in local fish populations.
2) It is also conceivable that the heavy oiling of a Sargassum community could lead to its destruction, however, no supportive data is presented.

c. Impact on the Nekton

Nekton, by definition, include all marine animals which are active swimmers and are able to migrate freely over considerable distances. It is believed that of the possible sources of impacts from this sale, only an oil spill could affect members of the nekton.

At the cellular/physiological level, Mironov (1970 cited by Hufford, 1971) found that the respiration in fish can be affected by oil through a variety of mechanisms resulting in the clogging of gills and damaging gill tissue.

At the behavioral level, Nelson-Smith (1971) has stated that fish seem to avoid contaminated areas. A side effect, however, is removal of habitat. Rice (1973) has found in laboratory studies that pink salmon fry are able to detect low, sublethal concentrations (as low as 1.6 mg/1 of oil for older fry) of Prudhoe Bay crude and show avoidance behavior to it. He acknowledges that the effects of sublethal concentrations of oil on salmon migrations are unknown, but emphasizes that the potential for harm is clear. Salmon, of course, do not inhabit the Gulf of Mexico, but many Gulf species are migratory. Blumer (1969) has proposed that physiological/behavior effects may interfere with nutrition of fish by:

a) blocking taste receptors, and

b) mimicking natural chemical messengers which attract predators to their prey.

It is also significant that fish could suffer stress from feeding on contaminated prey such as the oil-ingesting copepods pointed out in subsection b. above.

No information has been found on the effect of spilled oil on members of the nekton other than finfish. Brownell (1971) and LeBoef (1971) mounted a scientific investigation following the Santa Barbara spill to determine if the spilled oil had any effect on marine mammals. Numerous animals that were found dead after the spill, including gray sperm and pilot whales, dolphins, and elephant seal pups, were examined histologically and chemically for the presence of oil or pathology related to oil. No such oil or pathology was found and the deaths were attributed to natural causes. It was also noted that the number of deaths was not abnormally high.

Only two marine mammals are known to occur in significant numbers among the northeastern Gulf nekton: the bottleneck dolphin in inshore waters and the spotted dolphin offshore. On the basis of the Santa Barbara data alone, we hesitate to predict that members of these two species will not be affected by an oil spill, but we have no basis whatever for reaching the opposite conclusion.

Summarizing the impacts on nekton:

1) Of the possible sources of impact, only oil spills would adversely effect the nekton.
2) Finfish seem to avoid areas of contamination. This alleviates direct toxic impacts on individuals but could result in alteration of normal migration patterns or feeding behavior.
3) Impacts on marine mammals is a possibility, but no evidence exists on which to base such a prediction.

d. Impact on Oceanic Birds

Woolfenden and Schreiber (1973) report the eastern Gulf is important to the existence of large populations of numerous species of birds. However they note that little is known of the biology of the pelagic birds and that apparently, most species occur only in small numbers. These include such groups as the storm petrels and jeagers.

In the past, the injury and death of thousands of seabirds and shorebirds has been the most obvious impact of numerous massive oil spills. We believe that in the open Gulf, oil spills would be the only source of impact to affect oceanic birds. However, because they are present only in small numbers, and because none are reported to nest in the northeastern Gulf coastal area, we believe the impact on oceanic birds will be insignificant.

2. Impact on the Open Gulf: Benthic Marine Life

In the open Gulf, the effects of oil spills would probably be minor in deep waters but take an added significance in shallow near-shore waters. Impacts caused by the release of drill cuttings and muds, and by the pipeline burial operation will be important in all water depths.

a. Impact on Artificial and Hard Substrate Communities

Natural hard substrate communities occur on occasional rock out crops on the continental shelf between Louisiana and Cedar Key, and are epitomized by the Florida Middle Ground. In addition to areas of natural hard substrate there are now 95 artificial reefs located in shallow waters between Louisiana and Charlotte County, Florida, and plans to deploy many more. Sources of impact to these communities are oil spills and drilling mud/cuttings discharges. Pipeline burial would naturally be excluded from such areas.

Unfortunately no studies on the effects of spilled oil have ever been performed in communities even remotely resembling these continental shelf hard substrate communities. Instead, oiled hard substrate communities studied in the past have always been intertidal, where heavy oiling, followed by exposure to air has nearly always produced a rather severe impact. A prediction of impact at this time would be purely conjectural and unwarranted.

Impacts due to drilling mud/cuttings are obvious and are therefore more easy to predict. This impact, of course, would not involve the many artificial reefs because none are in the vicinity of tracts. It has been observed in the past that the release of mud and cuttings from an offshore platform results in a deposit of material approximately 100 feet in diameter and up to four feet thick at the center. Although some turbidity would result from this operation, the effect of physical burial and smothering is surely far more important. Mortality in the area of deposit would be complete. In the longer term it is also significant that the coarse to fine cuttings deposit would never provide a substrate similar to the original and would therefore rule out larval setting and colonization by local endemic forms. Eventual colonization would likely be by soft- or unconsolidated-substrate benthos. This impact could be termed "alteration of habitat" and would result in a small biotic community permanently different from the original.

Summarizing the impacts on hard substrate and artifical reef benthic communities:

1) Impacts could result from spilled oil and discharge of drilling muds/cuttings. Impacts due to spilled oil are not assessed due to a complete lack of relevent literature.
2) Impacts due to drilling muds/cuttings discharges would be severe in a small area. Existing benthos would be buried and smothered. Colonization would probably be by forms adapted to a sandy or unconsolidated substrate, thus bringing about a permanent alteration of the ecosystem.

b. Impacts on Shallow to Deep Shelf Communities not Occupying a Hard or Artificial Substrate

It seems important to distingush this benthic community from that above because this one will be the site of pipeline burial operations and in addition, spilled oil can be incorporated into the sediments (the substrate).

The effects of an oil spill could be severe in shallow areas, with lethal toxicity to many species, leading to a substantial alteration of the community.

Data of Sanders, Grassle, and Hampson (1972) show immediate and nearly complete mortality of many forms of benthic animals following the spill of No. 2 fuel oil near West Falmouth, Massachusetts. The bivalve molluscs (clams, etc.) seemed especially vulnerable. As a rule, when concentration levels of oil in the sediment apparently decrease below a certain level, with the passing of time, affected areas were recolonized by resistant forms, especially the marine polychaetous worm Capitella capitata. This generally occurred within three to six months of the initial oiling. With the passage of about 10 to 20 months, the more sensitive molluscs resettled many areas. However, at some harbor stations apparently receiving a heavy oiling, some highly sensitive forms such as the ampelisicid amphipods had not returned. Farther offshore, this required about six months.

Chemical analysis of edible shellfish species made following the West Falmouth spill revealed that the fuel oil had been absorbed or ingested and could subsequently be found in oyster bodies and scallop muscles in quantities sufficient to require the closure of shellfish beds to harvesting (Blumer, Souza, and Sass, 1970).

It is especially significant that contaminated shellfish elicited no oily taste when eaten--which sheds considerable doubt on the practice of determining pollution levels by taste tests, as is common in many areas.

The impacts of spilled oil on these benthic communities will likely prove to be somewhat less severe than at West Falmouth. The lighter fuel oils have generally proven to be far more severe in toxic effects than crude oils. There is additional reason for concern in the present proposal due to the proximity of commercial shellfish beds to areas which will likely receive frequent oiling. The area just outside Tampa Bay is the site of a hard clam fishery and the area just seaward of Port St. Joe is the site of a scallop fishery. Because of probable tankering of OCS produced oil from these two ports, approaching tankers will be discharging oily ballast water in the vicinity of these shellfish fisheries.

In the northeastern Gulf, especially on the Florida shelf, if drilling operations were carried out over the relatively harder carbonate sand bottoms, it is possible that the highly productive seagrass beds might be smothered by the drill cuttings which are discharged overboard. Unfortunately, the offshore distribution of grasses is apparently patchy and not well known. Therefore, it cannot be said with certainty that such an impact would occur.

Also associated with these relatively hard bottoms are small to large populations of non-burrowing, attached benthic animals such as the sponges, soft corals, anemones, bryozoans and others. These would also be buried and smothered by drill mud/cuttings discharges. If the drill cuttings are similar in consistency and composition, colonization and repopulation could proceed rapidly. If, on the other hand, the drill cuttings were wholly foreign in consistency and composition, the deposit might remain barren for a long period or be populated by different types and numbers of animals.

In water depths of less than 200 feet new common carrier pipelines are entrenched by jetting away the sediment beneath the pipe and allowing it to settle into the underlying trench. Partial burial takes place quite rapidly as the disturbed sediments slide and settle back into the trench. Complete burial may take substantially longer, depending on the velocity of local bottom currents and consistency of the surrounding sediments.

The jetting process physically disrupts the sediments in its path and also causes resuspension of large quantities of sediment. Most, if not all, benthic fauna are either destroyed by the jetting or raised into the surrounding water and rendered completely vulnerable to predation. Although recolonization would begin immediately, the native fauna could not be fully restored until seasonal reproduction cycles had been completed by representative species from adjacent areas, which would provide a supply of larvae to settle and enter the reworked substrate.

Turbidity resulting from resuspended sediment is capable of producing an adverse impact on filter-feeding molluscan and crustacean benthos by clogging the filter-feeding apparatus or blocking respiratory surfaces.

Another possible source of impact during pipeline dredging is the resuspension of toxic heavy metals and persistent pesticides that may have been deposited in the area by a polluted stream and land runoff. The possibility exists that these toxic materials could be ingested by lower marine life and could then be magnified through the food chain until they accumulated in serious quantities in top carnivores, including species harvested for human food.

Obviously, we must conclude that the benthic community will be disrupted or destroyed in the path of pipeline dredging operations. We believe the duration of the impact will be short, with recolonization being completed within a year or two. The possibility of impact by resuspended toxic heavy metals and persistent pesticides will be eliminated in OCS waters by the pipeline corridor studies included as part of this proposal and described in Vol. 1., Sec. 1.4.

Summarizing the impacts on benthic communities associated with soft to firm sediments:

1) Impacts would result from nearly all offshore operations, oil spills from platform, pipeline, tanker, and barge, discharge of drilling muds/cuttings, and the pipeline burial operation. Only the discharge of formation waters will not produce an impact.
2) Although the impact is thought to be somewhat less severe than the West Falmouth example, a massive spill in shallow waters could cause widespread mortality and bring about an alteration of the ecosystem that would last for some time. It is possible that contamination of commercial

shellfish species could result from a massive spill and more significantly, near Tampa and Port St. Joe due to tanker ballast discharges.

3) The discharge of drilling muds/cuttings will result in the burial and smothering of all benthos in a small area. Differences in consistency between native substrate and these discharges may lead to an alteration in the community.
4) Pipeline jetting operations will destroy all benthic in fauna in the path of the right-of-way. Recolonization here should be by endemic species and should be fairly rapid.

c. Impact on a Unique Benthic Community: the Florida Middle Ground

Twenty-five tracts included in this proposal lie in the Florida Middle Ground, an area sufficiently rich and diverse in community composition, dominated by tropical element, to be considered unique. The area is described in detail in Vol. 1, Sec. II.E.3.b.(12).

It was noted in the earlier section cited above that the reef community is apparently based nutritionally on the benthic brown algae that carpets the bottom during summer months. A severe impact might be dealt to this community by the release of muds and cuttings. The benthic brown algae is incapable of attachment and growth on an

Unconsolidated substrate. With its primary producer population diminished and its sessile fauna smothered, the food web will be broken down for the remaining members of the community. To determine the areal extent of this impact we will use the common assumptions of 80% lease rate, full development and 3 platforms per tract this amounts to a total of 60 platforms. According to our measurements, the Middle Ground occupies an area of roughly 8x13 miles, or 2.9×10^9 ft^2. Sixty circular patches of mud/cuttings deposits of about 100 feet diameter amounts to 4.7×10^5 ft^2, or about 0.016% of the total area in the Middle Ground. As yet we have no basis in existing data to predict that the impact on the Middle Ground benthic is ecosystem would be quantitatively proportional or more, or less than this figure. More conclusive data will have to come from the studies described in Vol. 1, Sec. I.H. At this time however, it seems agreeable to hypothesize that at least a small, subtle change in the Middle Ground ecosystem will occur.

An additional impact could result from the fines in the drilling mud being dispersed over a wider area. Sedimentation is inimical to healthy coral growth, of which there is an abundant population on the Middle Ground. Although corals can cleanse themselves of moderate amounts of sediment falling from above, most cannot live for long if heavily coated or buried. Diversity in coral species decreases as one moves from clear to turbid waters and coral larvae cannot settle or survive on an unconsolidated substrate (communication with Dr. Thomas Bright, Texas A&M University).

Summary of impacts on the Florida Middle Ground:

1) Impacts will result from discharge of drilling mud/cuttings.
2) The cuttings deposit will bury and smother all non-motile benthos over a small area below each platform.
3) The wider dispersion of drilling mud fines may decrease the population of corals.
4) The possibility exists that the above impacts could act to produce a subtle, small change in the entire Middle Ground ecosystem.

3. Impact on the Shoreline

In the northeastern Gulf of Mexico, shorelines of the mainland west of Mobile Bay are predominantly silty and of low energy. Shorelines of the Chandeleur Islands, of the islands forming the southern boundary of Mississippi Sound, and of all islands and the mainland coast from Mobile Bay east to Cape San Blas are sandy and of moderate energy. Except for small sections of the Mississippi mainland, the Chandeleur Islands, the Mississippi and St. Bernard Deltas, and part of St. Vincent Island, no tidal marsh borders the ocean in the western portion of the area of interest. From Alligator Harbor eastward, the shoreline is considered to be of zero energy and consists entirely of tidal marsh with mangroves becoming increasingly common south of Cedar Keys. Just north of Clearwater, the beaches gradually become sandy again and are of moderate energy. The shoreline in the area encompassed by this proposal will sustain impacts from spilled oil and from pipeline burial.

a. Impact on the Intertidal Zone

(1) Impact on Artificial and Hard Substrate Communities

Along the northern coastline, these communities are very small and widely scattered, located primarily on pilings and jetties. Along the west coast of Florida, where they exist on pilings, jetties, and mangrove roots, the impact of concern would be caused by spilled oil.

Few investigations have been made of the effects of oiling on these specific types of communities, but for the purposes of this discussion, it will be assumed that there would be some similarity to an oiling of the rocky intertidal areas of other coasts that have been subjected to spilled oil.

Studying the effects of the Chedabucto Bay spill of bunker C oil, Thomas (1973) found that most of the approximately 20 species observed, with the exception of those smothered by heavy oil, appear to have been little affected. Barnacles showed no unusual mortalities and settlement of larvae occurred in following seasons. Periwinkles, the most common intertidal animals, remained abundant and still occupy generally the same zones. A seaweed, Fucus, was reduced or eliminated at the locations where oiling was severe, and recolonization has not been successful. The seaweed did not die abruptly but declined gradually in the 10 months or so following initial oiling.

After studying the effects of pollution from Torrey Canyon, Bellamy, et. al. (1967) hypothesized that the oil pollution caused an alteration of the balance of ecosystems dominated by attached seaweed by destruction of the grazing organisms. Common grazers, the limpets, were apparently reduced by about 40%. The severity of the impact to grazers was greatly increased by the use of detergents but there is no long-term direct damage to the algae by either oil or detergent. The effects of oiling on the rocky intertidal areas near Santa Barbara (Nicholson and Cimberg, 1971) and San Francisco (Chan, 1972) were attributed primarily to smothering.

During the study of the effects of a tanker spill of Bunker C and diesel near Panama, Rutzler and Sterrer (1970) observed that the characteristic intertidal algal community on the red mangrove stilt roots were practically eliminated in all oil exposed areas. Also killed were the sedentary animals of this zone such as oysters, mussels, barnacles, sponges, tunicates, and bryozoans.

While an accurate estimate of the probability of tanker-spilled oil reaching the shoreline cannot be made, it is surely more likely to occur, at least near ports of call, than from a platform spill. We believe it is unlikely that large amounts of oil from a platform spill would ever reach the shoreline. 1/ In the event oil does reach the artificial and hard substrate benthic communities of the intertidal zone, we anticipate that the effects would be similar to those described in the literature cited above.

(2) Impact on the Sandy, Moderate Energy Beach

Impacts on this biotic zone will result from pipeline burial operations and from spilled oil.

1/ See our response to EPA's review of the Draft Statement

During the Arrow spill study (Operation Oil, 1970), excavation of clams revealed oil extending down most burrows and often forming a pool at the bottom. Clams generally moved up the burrow to evade the pools, and sometimes left the entire substrate. Some mortality occurred and even the live clams were unresponsive, although they recovered with prolonged exposure to air.

Rutzler and Sterrer (op. cit.) have pointed out that sandy beaches have a horizontal rather than vertical extension, and a large "internal" surface. They therefore act as huge natural filters for the water transported in by waves and tides. In the case of an oil spill large quantities of oil will be pressed into the sand, mixed with the subsurface return flow, and transported to other areas. Rutzler and Sterrer (op. cit.) found a large apparent decrease in the total number of individuals present in oiled sands, although they were unable to prove it due to a lack of baseline data.

If oil were to be deposited on the low to moderate energy sandy beaches of the northeastern Gulf, there would probably be a substantial kill of infauna. Removal of oil by natural means would probably be very slow because seasonal erosion and accretion of beach sands is minimal in these areas.

During pipeline laying operations, pipelines are buried by jetting up to a point where the jetting barge would be in danger of shoaling if further progress where made. From this point on, the pipeline is usually buried by the use of a suction, clamshell or bucket dredge. As this operation crosses the beach, it will disrupt and rework the sand for a width on the order of 30-40 feet.

Burrowing animals and rooted plants in the path of the operation will be killed or damaged. As with benthic communities on the continental shelf, recovery would depend on the timing of reproductive cycles of organisms in adjacent areas.

b. Impact on the Exposed Beach

The beach zone, lying behind the intertidal, would receive an impact from pipeline burial operations. As noted above, a strip of beach 30 to 40 feet wide will be disrupted and reworked during pipeline burial. A zone of perhaps 60 feet in width will suffer devegetation from construction equipment traffic.

In such areas, beach erosion by wind could prove to be a problem where the sea oats and other dune vegetation have been removed along the pipeline route. Keating (1972) describes the demise of Caprice Island, Mississippi after sea oat removal: "... sea-oat roots are all that hold the barrier islands and mainland dunes together. Stripped of plant cover, the Isle of Caprice blew away on every vagrant breeze..."

We presume that appropriate agencies of affected coastal states will want to work with the industry in determining the least environmentally hazardous areas, and may want to consider the requirement of a revegetation program where pipeline burial operations cause devegetation of beaches and dunes.

c. Impact on Shorebirds

In the past, the injury and death of thousands of seabirds and shorebirds has been the most obvious impact of most massive oil spills.

Shelton (1971) states that "The causes of death of oil-contaminated birds are usually complex. Clogging of plumage greatly reduces its insulating properties, while ingestion of oil during preening can cause a variety of pathological conditions including severe enteritis with necrosis of the duodenum... This, in combination with increased heat losses, may reduce feeding activity and a marked drop then occurs in the fat reserves of the bird, followed by muscular emaciation. It is in this critical condition that most oiled birds arrive on the shore, where further stresses are placed upon them by cleaning and attempts at rehabilitation. It is not therefore surprising that the mortality rate at cleaning centers is normally very high indeed." It has also been pointed out that a coating of oil frequently clogs the salt glands, thus preventing the birds from coverting saltwater to fresh, causing death by dessication.

The table on the following page lists oil spill-related bird mortalities as noted in the literature.

Table 8. Oil spill-related bird mortalities, world-wide.

No. Birds Affected	Source of Spill	Material Spilled	Location	Year	
3,600	Platform	crude oil	Santa Barbara, Calif.	1969	a
200	not specified	diesel oil	Firth of Forth, Scotland	1969	b
9,000	not specified	fuel oil	Aberdeenshire, Scotland	1970	b
1,000	not specified	"Oil"	Southwest England	1970	b
12,000 (Contaminated)		fuel oil	Northeast England	1970	b
1,000 (Contaminated)	Tanker		Southern England	1970	b
2,300	Tanker *Arrow*	Bunker C	Chedabucto Bay, Nova Scotia	1970	b
none	Platform-Chevron	crude oil	Offshore Louisiana	1970	b
3,500 (Contaminated)	Tanker *Delian Appollon*	Bunker C	Tampa Bay, Florida	1970	c
1,000	not specified	weathered oil	Martha's Vinyard, Mass.	1970	b
96,000	not specified	"Oil"	Kodiak and adjacent Is., Alas.	1970	b
none	Shell Platform	crude oil	Offshore Louisiana	1970	d
6,000	Tankers-Standard Oil Co.	Bunker C	San Francisco Bay, Calif.	1971	e
none	Amoco Platform	crude oil	Offshore Louisiana	1971	d

a -- Straughan, 1971a.   b -- *Environment* Editorial Staff, 1971.

c -- Unpub. Rep., Florida Game and Freshwater Fish Comm., Tallahassee

d -- Testimony of Dr. Carl Oppenheimer, OCS Public Hearing, New Orleans, Louisiana. Aug. 23, 1972.

e -- Chan, 1972.

In the history of OCS leasing substantial amounts of oil spilled from platforms have never reached the shore, and consequently, shore bird mortality has been negligable. However, two instances of bird mortality due to tanker accidents have occurred in the eastern Gulf. In 1964, the tanker S.S. Brothers George, of foreign registry, became grounded in shoal waters just off Dry Tortugas. In spite of a specific order from the Coast Guard not to do so, her captain attempted to free her by offloading the cargo of fuel oil into the sea, thus decreasing her draft. The oil washed ashore, affecting nesting sooty terns and other shore and wading birds.

On February 14, 1970, the Greek tanker Delian Appollon ran aground, spilling a cargo of Bunker C in Tampa Bay. It was impossible to assess with accuracy the total number of birds harmed or killed because of northward migration of waterfowl taking place at the time. It is known that a total of 3,500 oiled birds were captured and treated. No estimate was made of the number that died untreated, or of those that did not survive following treatment (Florida Game and Freshwater Fish Comm., unpublished report). Although the brunt of this impact was borne by the estuarine waterfowl, some shorebirds were also killed during this incident.

We believe that incidents of this nature could be repeated as the result of tanker transshipment of oil from Tampa Bay and Port St. Joe.

Indirect impacts on shorebirds include loss of habitat and nesting temporarily due to pipeline construction, and permanently, due to the construction of onshore facilities.

Summarizing the impacts on the shoreline:

1) The source of impacts to the shoreline communities are oil spills from tankers and pipeline construction operations. The possibility of large amounts of platform-spilled oil reaching shore is thought to be low.
2) In the event an oil spill reaches shore, a severe impact is predicted for the benthic communities of jetties, pilings, mangrove pneumatophones and stilt roots, the sandy intertidal beach, and for shorebird populations.
3) The natural removal of beached oil in the sale area is predicted to be slow due to the relatively low energy beaches present.
4) Impacts due to pipeline construction and burial operations through sandy beaches will result in the destruction of benthic intertidal organisms in the path of the operation. Recovery is thought to be fairly rapid. On the permanently exposed portion of the beach, devegetation could result in wind erosion, and shorebirds will be temporarily displaced from that portion of their habitat.

4. Impact on the Estuaries

The following estuaries may be the site of environmental impacts due to this proposed sale:

Escambia Bay - support facilities

Saint Joseph Bay - oil storage and tanker facilities, support facilities, oil pipeline

Hillsborough Bay - oil storage and tanker facilities, support facilities.

The impacts due to support facilities are believed to be quite minor, due primarily to small amounts of pollution from an increase in vessel traffic. The impacts due to storage and tanker facilities will be more significant and will be caused by oil spills during routine bunkering and the possible tanker casualty from collisions, grounding, or structural failure. There is also a possibility that a pipeline could be laid through St. Joseph Bay, Mississippi Sound, Big Lagoon, or Santa Rosa Sound.

a. Impact on Planktonic and Nektonic Estuarine Life

The effect of spilled oil on these estuarine forms will be similar qualitatively to those described for pelagic marine life in the open Gulf in subsection B.1. above. In terms of quantity or severity, the estuarine spill will be worse for at least two reasons:

1) The estuary is, of course, a smaller, semi-enclosed body of water, and given the small Gulf tides, oil will likely remain more concentrated for a longer period of time than in the open Gulf.

2) The larval and juvenile stages of many commercially and ecologically important fish species are spent in the estuaries and are therefore susceptible to a more severe impact. It has already been pointed out that larval stages are 10 to 100 times more sensitive to oil contamination than their adult counterparts.

b. Impact on the Estuarine Benthos

Impacts will result from spilled oil and from pipeline burial. As with the planktonic and nektonic forms, we believe the effects on estuarine benthos will be qualitatively similar to those described for benthic communities of the open Gulf in subsection B.2. above. Because of the limited quantities of water involved, and the semi-enclosed configuration, the impacts will express themselves more severely.

One unique feature of the estuarine benthos is the commercially and ecologically important oyster reef. Both commercial and non-commercial beds occur in all estuaries and adjacent to the sale area except one. We have no records which indicate that commercial beds occur in St. Joseph Bay.

Oyster reef communities will sustain a significant impact in the event of a massive oil spill.

Galtsoff (1959) noted that the major effect of industrial wastes and soluble components of crude oil is a reduction of the rate of various physiological functions, principally, ventilation of the gills. Specifically, these pollutants cause a reduction in the amount of time during which the oyster opens its valves for feeding and respiration, and also interferes with the coordination of the ciliary motion with the result that the pumping capacity of the gills is reduced. The reduction in feeding time (simultaneous with respiration) results in a lowered growth rate and poor quality oyster meats. It is well known that oysters can become contaminated with oil (Erhardt, 1972; Galtsoff, op cit.; Mackin, 1962) both from a massive spill and chronic low-level spillage.

However, there is still a lively debate by several scientists as to whether the oysters can cleanse themselves when the water is again free of oil. Oil contamination imparts an oily taste to oysters, rendering them unmarketable.

In Vol. 1., Sec. I.F.4.d, we included several pipeline routes proposed by the industry. It should be asserted however, that these proposed routes do not reflect our intentions and are in the realm of conjecture pending completion of the studies described as part of this proposal in Vol. 1, Sec. I.H. However, assuming for the purpose of impact discussion that the industry proposals are implemented, it is possible that pipelines will be constructed in the vicinity of commercial oyster reefs in either Big Lagoon or Santa Rosa Sound. Because pipe burial produces roughly similar effects to routine dredging, literature on the latter will be consulted in an attempt to predict the potential impacts.

According to Galtsoff (op. cit.), dredging activities are frequently harmful to oyster grounds. Dredging may adversely affect the oyster bottom in three different ways: (1) by changing the pattern of circulation, (2) by smothering the grounds with sediments, and (3) by releasing toxic substances entrapped in the deep layers of mud. The deposition of sediments stirred up by dredging and coastal construction is usually limited to a zone adjacent to operating sites. Dredging may, however, release the toxic substances accumulated for years in the mud of harbors and bays near industrial cities.

Because of the small size of the trench excavated, and the fact that spoil banks are not created, we do not believe that Galtsoff's first point is applicable to pipeline burial in estuarine areas. The third point is a possibility, but the second, if a pipeline passes through a reef is a certainty.

Other important features of the estuarine benthic community are the marine grass beds. Godcharles (1971), in studying the effects of hydraulic dredging in the vicinity of Tampa Bay, observed that after more than a year, no recolonization of local sea grasses occurred in the dredge truck.

In response to the recolonization failure, Godcharles recommends the prohibition of dredging in marine grass substrates. This information will be taken into account in our pipeline corridor considerations.

Summarizing the impacts on estuaries:

1) Three Florida Bays are identified as likely recipients of impacts; concern is expressed over the likelyhood and severity of impacts in St. Joseph Bay and Hillsborough Bay. The sources of impacts are identified as tanker spills and pipeline burial.
2) Qualitatively, the effects of oil spills in estuarine populations are similar to those identified for the open Gulf. The severity is thought to be greater due primarily to semi-enclosed configuration, limited amount of water volume, and relatively small Gulf tidal range.
3) Oysters and seagrasses were separated out for separate discussion. The effects of oil on oysters probably consist of feeding and respiratory interference and tainting of flesh. The latter is important to the commercial fishery.
4) The effect of pipeline burial near oyster reefs includes smothering the oysters with sediment, and possibly resuspending polluted sediments.
5) Long-term damage is done to grass beds by a hydraulic clam dredge and presumably would also result from pipeline burial.

5. Impact on Wetlands

The wetlands includes the tidal marshes, and mangrove swamps. Dominant marsh vegetation consists of spartina-type grasses and algae. Dominant fauna are the microconsumers (insects, worms, protozoa), although the most obvious and noticeable animals are the large populations of waterfowl and wading birds.

Three types of adverse impacts are possible in the wetlands environment: pollution by spilled oil, and disturbance during pipeline construction, loss of habitat by lands taken for installation of onshore pipeline terminals and gas and oil treating facilities.

It is likely that a tanker spill in either St. Joseph Bay or Tampa/ Hillsborough Bay would result in an oiling of the fringing wetlands. Oiling of the wetlands of the Big Bend section of Florida seems highly unlikely due to the remoteness from trans-Gulf tanker traffic and from tracts proposed for leasing. The Louisiana-Mississippi marshes in the northwestern corner of the proposed sale area seem the most likely to receive platform spillage due to predominately easterly winds and westward flowing currents, however, we do not fear that large amounts of oil involved would be large, primarily because of the distances involved.

Even though no information has been found concerning the effects of oil in the Gulf states wetlands, conclusions can be drawn from such effects in other areas.

a. Impact on Marsh Vegetation

British studies of salt marsh oiling followed a "moderately severe" spill of crude oil from the tanker Chryssi P. Goulandris in Milford Haven estuary, Wales (Baker, 1971; Cowell, 1969; Cowell and Baker, 1969). Two weeks after the spill, oily salt marsh vegetation had turned yellow and was dying, but new green growth was showing at the base of some species. One year later there were still dead patches in some communities. No observations were made of salt marsh fauna, but it could be expected that all aquatic species would be killed in the area affected by the spill .

Extensive information exists concerning the effects of pipeline construction in the marshes of Louisiana by Gagliano and associates of the Coastal Studies Institute. Their work has been of sufficient quality and resolution to allow them to assess wetlands losses due to several causes, including the petroleum industry, which they blamed largely on rig access canals. OCS development requires no rig access canals, only occasional pipeline canals, and these only in southeast and south central Louisiana. The Texas marshes have always been firm enough to allow trenching and backfilling with full recovery following in 1-2 years. The worst effect may be that trenching and backfilling through coastal marshes could be required for this proposal. However, the impact of pipelines and their onshore terminals in the marsh can be eliminated altogether if the respective States feel that disruption in these areas is unacceptable. They have the authority and power to prohibit pipelines, onshore facilities, etc., from entering the marsh if they wish to exercise it.

b. Impact on Mangroves

The mangrove component of the coastal wetlands will be damaged in the event of nearby oil spill. Fear has been expressed (LaRoe, 1972) that the mangrove community would be damaged in two ways: bacterial decay of leaves would be inhibited, and oil coating on the prop roots would cause the mangroves to die.

Rutzler and Sterrer (op. cit.) studying the effects of a Panamanian oil spill have hypothesized that mangroves, being a predominantly intertidal community, suffered the most under the oil spillage. The only mangrove damage they actually witnessed was the mortality of most young red mangrove seedlings. Their hypothesis of damage is based on the gross visual observation that the stilt roots of red mangroves and pneumatophores had been oiled.

Spooner (1970) was able to observe actual damage in connection with another spill. Immediately following an oil spill in Tarut Bay, Arabia, dwarf mangrove (Avicennia) leaves were oiled on the lower half of the plant. Observations 3 months later showed that some mangroves apparently had died, but many were surviving and some were bearing flowers and fruit. Spooners conclusion was "...that the mangrove and other saltmarsh plants had served to mop up considerable amounts of oil at the upper part of the tidal range"... and that after three months "...that these open mangrove areas were not affected seriously". We are sure Dr. Spooner's observations were accurate, but on the basis of "some" losing their leaves (apparently dying), "many surviving" and only "some" in flower and fruit, we conclude that the mangrove community was seriously affected and that the effects would last for some time. We would expect the Tampa/Hillsborough Bay mangroves, and those stretching out along the Gulf coast would be affected at least as severly as those observed by Spooner (ibid.)

c. Impact on Wildlife in the Wetlands

The wildlife of the wetlands will most likely suffer disturbance during pipeline construction, loss of habitat from onshore terminals and support facilities, and in the vicinity of Port St. Joe and Tampa, oiling due to tanker leaks. Perhaps the most uncontrollable impact to wetland wildlife will be the oiling of potentially great numbers of waterfowl and wading birds. Seasonally, waterfowl numbers can climb to tremendous proportions. At St. Marks Refuge alone some 70-80,000 red heads may be found wintering over. The details of bird oilings have already been included in two previous subsections (B.1.d. and B.3.c) and will not be repeated here.

Of the remaining wildlife, those species which are aquatic or amphibious will also receive a significant impact in the event of an oil spill. We believe, however, that the effects of oil on such as alligators, turtles, frogs, muskrat, nutria and snakes, has not yet been determined, but we estimate that tolerance to impacts will be roughly a function of body weight and integumentary structure.

Appropriate State Agencies may wish to eliminate or minimize habitat loss in the wetlands by assisting the industry in finding more environmentally acceptable routes or by identifying seasons in which impacts will be minimal.

Summarizing the impact on wetlands:

1) There are three sources of impacts oil spills, disturbance from pipeline construction, and habitat removal by construction of onshore facilities.
2) Oil spills in marshes will probably cause mortality of the small aquatic and amphibious animals. A moderately severe spill will cause marsh grasses to die back to the roots. A spill in or near the marsh will also cause the oiling and death of wading birds and waterfowl. An oil spill reaching the mangrove swamp will kill the community dwelling on the stilt roots and pneumatophores. Mangroves seem to suffer a moderate - to severe impact from oiling.
3) A habitat disturbance will result from the construction and burial of pipelines.

6. Impact on Endangered and Threatened Wildlife

There are numerous species of endangered and threatened animals in the northeastern Gulf area (see Vol. 1, Sec. II.D.). There are several reasons for species becoming endangered or threatened; prominant among these reasons is the loss of suitable habitat, although overhunting has also been a cause. Any activity resulting from this proposed sale which would further limit the suitable habitat for an endangered or threatened species would increase the danger to its survival. It is also possible, of course, that an oil spill could effect an endangered or threatened species if it were to occur in its habitat, which would further endanger the survival of the species.

C. Impact on Air and Water Quality

1. Impact on Air Quality

The quality of air over the sale area could be degraded by exhaust emissions of stationary power units and service vessels, and by the accidental release of oil and gas from wild wells.

The impact of exhaust emissions is unknown, but thought to be small and unimportant.

According to one authority 1/ the average composition of Natural Gas as delivered to pipelines in the U.S. is:

Methane	CH_4	72.3%
Ethane	C_2H_6	14.4%
Carbon dioxide	CO_2	0.5%
Nitrogen	N_2	12.8%

(Small amounts of sulphur and other materials could also be present in some localities.)

If the wild well were not burning, obviously, the above gases would be released into the air. If the gas well was on fire, combustion would be essentially complete and the emissions would consist almost entirely of carbon dioxide (CO_2) and water; the nitrogen would remain as $N2$ and any sulfurous gases would be oxidized to SO_2. The resulting impact would not be great.

1/ Henry A. Ley, "Natural Gas", in Geology of Natural Gas, Amer. Assoc. Petrol. Geol. Tulsa, Okla. (1935) pp. 1073-1149. as cited by Levorsen (1958).

If a wild oil well were releasing crude oil onto the water, the resulting impact would be substantially greater. If the oil does not burn, a significant amount of it will evaporate. During the Chevron, 1970, spill it was estimated that 15% of the roughly 30,000 bbl. spilled evaporated. At an average density of 310 lb./bbl., this incident would have introduced almost 14,000 lb. of hydrocarbons into the air. Some oil spills in the past have resulted in fires.

A reasonable estimate of the range of emissions, assuming complete combustion, that an oil well fire could produce per 1,000 bbl. burned, might be as follows 1/:

CO_2 : 340,000-347,000 lb.
SO_2 : 620-34,000 lb. 2/
NO : 660-10,000 lb.

(As a point of reference, during the Chevron - 1970 fire and spill, the maximum spillage rate was estimated to be 1,000 bbl. per day.)

Combustion of oil would in reality be incomplete, however, and emission would contain somewhat less of the above compounds, but would include,

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1/ Values used in calculation are based on world averages for curde oil of 310 lb/bbl.; Percent content of weight is: carbon 82.2 to 87.1, sulfur - 0.1 to 5.5, nitrogen - 0.1 to 1.5 (Levorsen, 1958).

2/ SO_2 emission would be less for Gulf of Mexico crudes, which range from 0.1 to 0.5% sulfur.

in addition, such materials as volatilized petroleum, particulate carbon, carbon monoxide, nitrous oxide, sulphur monoxide, along with other altered or partially oxidized matter. There is no reliable way to predict in advance the relative volumes of each of these possible emissions because it would depend, among other things, upon moisture content of the air, wind speed, pattern of oil spray from wild wells, number of wells involved, chemical content and physical character of the oil itself, and types of equipment and materials other than oil that might also burn.

Massive spills from wild wells are not the only source of spilled oil. Information presented in section III. A. 2. c. demonstrates that over 800 bbl. were spilled in the first nine months of 1972 as the result of an equal number of minor spills. The net result is that a small amount of spilled oil is floating somewhere on the waters of the northwestern Gulf almost continually. Concern has been expressed 1/ that the evaporation of this spilled oil may be the cause of the substantial levels of hydrocarbons which have been detected in the sea breeze coming off the Gulf. Preliminary surveys 2/ indicate that the content of reactive (smog-producing) hydrocarbons in the sea breeze between Corpus Christi and Port Arthur are at a level three times higher than the national average. At the present time there is no hard evidence as to the source of these materials.

1/ Personal communication with Mr. Kenneth Ports. Texas Air Pollution Control Service.

2/ Ibid.

At this time, we are unable to predict the degree of deterioration in air quality that will occur because of this proposed sale.

2. Impact on Water Quality

The natural condition of sea water may be altered and degraded in several ways during oil and gas operations.

Debris and bilge will be released into Gulf waters from the many seismic vessels, crew boats, tugs, and service and supply boats used throughout the operation. No estimate can be made of the quantities involved. They should be similar to amounts released off all types of vessels nationwide.

During drilling operations, drilling fluids and drill cuttings will be discharged into the sea. Most drill cuttings in the Gulf consist of sand and shales and therefore cause no turbidity, but settle to the bottom quite rapidly, on the order of minutes. The chemicals used in drilling muds have a relatively low level of toxicity and are all clay-type emulsions. When discharged, they produce a plume of turbidity in the water near the surface. The visible plume is on the order of a few feet wide and tens of yards long.

It has been estimated that 2,100 barrels of cuttings and several tons of turbidity-producing mud compounds are discharged overboard during the course of drilling an average 10,000 foot well.

The production and discharge of formation waters (oil-field brines) has been discussed earlier (section I. F. 3. b.). Three components or properties of formation waters contribute to water quality degradation when released into the sea. One is the small amount of entrained liquid hydrocarbon. There are some locations disposing of formation water where the treatment equipment puts out an effluent with less than 25 ppm oil content, but the facts also show that this control is not being accomplished across the board on a continuing basis. Many other locations only manage to meet the requirements of OCS Order No. 8, releasing waters with entrained oil averaging less than 50 ppm. The second property of formation water that degrades water quality is its high concentration of dissolved mineral salts. This value ranged from 61,552 mg/l to 270,400 mg/l in 76 samples from the OCS off Louisiana. This contrasts sharply to the average sea water salinity of 35,000 mg/l. The third degrading property results from the fact that formation waters are devoid of dissolved oxygen. Unfortunately, no estimate of the amount of formation water to be discharged as a result of this sale can be made at this time.

Water quality could be further degraded as the result of accidental oil spills. It was estimated in section III. A. 2. that, based on the 1971-72 rate of oil spillage, 1,300 to 2,200 bbl. per year could be spilled from tracts included in this sale. Based on data gathered from

1964 through 1972, most of which predates implementation of the OCS operating orders, the projected rate of spillage from tracts included in this sale could be as high as 14,500 to 23,500 bbl. per year.

In addition, a few hundred bbl. per year will likely be released through minor spillage. Part of this spilled oil would be removed by clean-up operations and some would evaporate, but the largest proportion would probably be dispersed into the waters of the Gulf.

Another source of water quality degradation is the resuspension of sediment during pipeline construction and burial. This operation was discussed in section I. F. 4. The jetting away of the substrate from beneath the pipeline will result in creating a plume of turbidity trailing away from the operations in the direction of the current. The plume can reach proportions of several yards wide and hundreds of yards long if the substrate is exceptionally muddy. The duration appears to be on the order of several hours at a given location.

D. Impact on Commercial Fisheries

Three types of impacts interfere with commercial Gulf fisheries.

1. Removal of Sea Floor From Use by Trawlers

All shrimp and industrial bottom fish are caught by dragging a large trawl across the sea floor. Every site occupied by a drilling or production platform and its attendant service boats and barges must be avoided by trawlers. If the structure is a jack-up drilling rig or permanent production platform, the area of sea floor removed would amount to 2 to 5 acres. In deeper waters (over 300 feet) a semi-submersible drilling rig with its anchoring system would occupy up to 325 acres (assuming a 1500 foot anchoring radius). The duration of exploratory drilling ranges from under 45 days for a single well to around six months for multiple well explorations. Permanent production platforms may remain in place for 10 to over 20 years.

The probability that permanent platforms will be erected on each tract, based on past exploration success rates, is about 35%. This is to say that approximately 1 out of every 3 tracts offered for lease will eventually require the erection of platforms for its development. Many tracts, about 2 of 3 offered, may never be developed. It is estimated that each full tract (5,760 acres) developed will average three structures per tract. Using the actual dimensions of a platform, three per tract would physically cover approximately 0.02% (1.0 to 1.15 acres) of each tract's sea floor. Taking into account a navigational safety zone around them and using the 2 to 5 acres per platform figure, trawlers may be denied up to 0.3% (15 acres) of the sea floor per developed tract.

Total number of platforms required to develop a lease area and their spacing relative to each other are important factors in considering their potential impact on commercial fishing activities. Because it is impossible to determine these factors in advance of a proposed sale, a special stipulation (Vol. 2, Sec. IV. D. 1., Mitigating Measures) has been suggested as a measure to be responsive to an impact that it is believed will result if careful planning and coordination are not undertaken.

2. Creation of Obstructions on the Sea Floor that Cause Damage to Trawling Nets

The obstructions referred to here are underwater stubs, large pieces of debris, and unburied pipelines.

The source and nature of stubs was described in Vol. 1, Sec. I. F. 2. b. As already stated, Coast Guard regulations require that stubs be marked by a buoy at the surface if located in 80 feet or less of water. However, the Coast Guard has informed us that in spite of regular maintenance and replacement, these buoys are frequently found to be missing. If a trawler pulls his net across a stub, it will certainly be badly damaged or lost.

Large pieces of debris, such as equipment, piping, structural members, tools, and the like, may accidentally be lost off a platform, service boat or barge. If this occurs off or very near a platform, it may be located easily by divers and retrieved. However, if it is lost off a boat or barge underway, the location may not be known accurately enough to allow its subsequent recovery. Depending on the size and weight of items lost in this way, varying amounts of damage may be done to trawling nets of fishermen unlucky enough to snag them.

It has also been reported 1/ that unburied pipelines (beyond the 200 foot depth contour) pose a serious problem to the shrimp trawling operations. The following table of shrimp catch statistics from the area between the Mississippi River to Charlotte Harbor, Florida emphasizes the catch by depth of water and value. 2/ These data were generated from NMFS Shrimp Fishing Grid Zones 4 through 12 and the internal water areas within the zones. (See Table 9).

Over 19 million pounds or 87% of the catch was harvested from waters landward of the 20 fathom depth contour. The monetary value of these heads-off dock side shrimp is approximately $15 million or 82% of the total catch. The value per pound varies from $0.63 to $1.16 within the 20 fathom zone. Seaward of the 20 fathom contour the value by depth

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1/ Testimony of James C. Farrelly, President, Louisiana Shrimp Association, presented at August 23, 1972 OCS Public Hearing, New Orleans, Louisiana.

2/ Data from Department of Commerce, 1973, Gulf Coast Shrimp Data, Annual Summary, 1971, Current Fisheries Statistics No. 5925, National Marine Fisheries Service, NOAA.

Table 9. 1971 Shrimp Catch by Depth of Water from Charlotte Harbor, Florida to the Mississippi River. (units of thousands)

Fathoms

Species	0-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	+40		Total	Percent Species Caught
Brown	5,944	3,366	2,547	1,198	1,021	876	427	68	2		15,449	72
White	2,265	1,641	89	19	18	7	2	-	-		4,041	19
Pink	333	1,040	460	110	-	3	-	-	-		1,946	9
Other	44	-	-	-	-	-	-	-	21		65	<1
Total	8,586	6,047	3,096	1,327	1,039	886	429	68	23		21,501	
Percent of Catch	40	28	14	6	5	4	2	0.7	0.3			
Value	5,390	5,350	3,067	1,539	1,390	1,289	669	100	24		18,818	
Percent of Value	29	28	16	8	7	7	4	0.8	0.2			
Value per pound	0.63	0.89	0.99	1.16	1.34	1.46	1.56	1.47	1.04		0.88	

Reference: Department of Commerce 1973, Gulf Coast Shrimp Data, Annual Summary 1971, Current Fisheries Statistics No. 5925, NOAA XCFSA 5925 GCS, 30 p.

zone varies from $1.34 to $1.04 with the 31-35 fathom grouping being the highest with $1.56. These data correspond to the generalized shrimp portrayal in Fig. 38, Vol. 1. 1/

Pipeline corridors will be established, wherever possible, in the area of this sale. (See Vol. 2, Sec. IV. C.). Pipelines within the corridors will be buried to a depth of 3 feet out to the 200 foot contour. Less than three percent of the total shrimp catch in the eastern Gulf is seaward of the 200 foot contour. Additional measures to require burial of pipelines seaward of the 200 foot contour for protection of the small shrimp catch taken in that area in light of its value could be considered if information is provided concerning the frequency, location, or severity of incidents involving trawling operations and unburied pipelines.

3. Contamination of Fish by Spilled Oil

Fish which are either externally coated or internally contaminated with oil are unmarketable. It has been shown that fish that live in the vicinity of chronic spillage are likely to be internally contaminated. Ehrhardt (1972) has found that oysters taken near the entrance of the Houston Ship Channel in Galveston Bay, Texas are contaminated with a high content of petroleum-derived aromatic hydrocarbons. Because aromatic hydrocarbons are much more soluble in water than paraffinic and naphthenic hydrocarbons, the oysters most likely take up

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1/ Fig. 38 is a composite portrayal of the shrimp fishery depicted in Bureau of Commercial Fisheries' Gulf of Mexico Shrimp Atlas, Circular 312, U.S. Dept. Interior, 1969.

the aromatic fraction as a watery solution through their gills and, being filter-feeders, as particulate matter. The author found the composition of the oyster contaminant to be similar to many Texas crude oils, among them Conroe, Beaver Lodge, and Lee Harrison. Connell (1971) has shown that a kerosene-like tainting in Australian mullet is due to the presence of kerosene-like hydrocarbons in the flesh. He found the contaminating compounds to be similar to substance isolated from river sediments, and that government Fish Board condemnation records show that periods of condemnation coincide with periods during which mullet have just left the estuaries and large catches are made. The river used by the mullet flows alongside oil refineries and associated storage and wharf facilities. Volatile hydrocarbons were found in the water adjacent to petroleum storage facilities and also in the river's estuary near a sewage outfall. Scarratt (1971) has found that commercial species of scallops ingested spilled Bunker C oil. Subsequent chemical analysis revealed the presence of Bunker C in the mantle, digestive gland, adductor muscle, and gonad, leading to the conclusion that the scallops have assimilated the ingested Bunker C oil.

Oyster beds have been contaminated in the past from oil spilled in the marshes, bayous, and bays in the delta region of Louisiana, but we are unaware that contaminated catches have ever been taken in the open waters of the Gulf, but note that this may be due to fishermen avoiding oily areas. We believe there is a distinct possibility that contaminated fish could be found in the norhtwestern Gulf if appropriate analyses were made.

In summary, the general consensus of Gulf fishermen is that underwater stubs present the greatest problem; the presence of offshore structures are a moderate inconvenience; and, the debris problem is minimal. Based on past OCS experience, we anticipate no impact to result from contamination of catches.

E. Conflict with Ship Traffic and Navigation

In seas adjacent to the United States, including the Gulf of Mexico, safety fairways have been established for the safe passage of vessels enroute to, or from, U.S. ports. However, an unknown number of ships do not use these fairways, greatly increasing the possibility for a collision with drilling rigs, permanent platforms, and their attendant vessels. Impacts which could result include loss of human life, spill of oil, release of debris including parts of, or the entire drilling rigs, and the ship, if it sinks. The contents of the ship's cargo could pose a serious threat to the environment if it includes toxic materials such as chemicals, crude oil, or refinery products. Statistics on ship-platform collisions were given in section III. A. 2. d.

Floating trash accidentally lost off platforms also constitutes a hazard to boats. Damaging collisions can result between small fast boats and floating drums, cans, and wood. The screws of all sizes of motor boats and vessels can be fouled on floating plastic sheeting and plastic or nylon ropes. The extent of this problem is unknown.

All oil production from this proposed sale would be moved onshore via pipeline except, possibly, that from the two areas Pensacola South No. 1 and Tampa-Tarpon Springs should the total developed production from either area be less than 10,000 bbl./day. Thus the maximum volume of crude oil that can be expected to be moved by barge is 20,000 bbl./day and assuming 20,000 bbl. barges used in this service, the incremental barge traffic in the area would only be one trip per day. In the port of Tampa, assuming 10,000 bbl./day production from Tampa-Tarpon Springs, the incremental port traffic would be one barge every two days and one 30,000 dwt tanker every 22 days or 200 vessel calls per year, a 1.6% increase over the 1971 vessel traffic shown in Table 20.

It is estimated that, when fully developed, the production from this proposed sale will require two 140,000 bbl./day tanker terminals each loading a tanker every 1.4 days. This would add about 1040 vessel calls per year in the Gulf of Mexico, (each tanker loading requires an unloading at another Gulf port) or about a 0.5% increase over the 215,000 total vessel calls in 1971 shown in Table 10.

Table 10. Major Ports and Harbors
U.S. Gulf Coast - Year 1971 1/

Harbor	Max. Depth	Freight Traffic (Short Tons x 1000)		Vessels (Inbound)	
	(Feet)	Total	Petroleum 2/	Total	Tanker & Tank Barges 3/
Tampa-including St. Petersburg, Fla.	35.0	35,321	8,036	12,523	843
Port St. Joe, Fla.	37.0	689	625	311	187
Panama City, Fla.	34.0	1,677	1,024	1,608	430
Pensacola, Fla.	33.0	1,082	739	1,142	500
Mobile, Ala.	42.0	24,919	4,225	13,350	1,756
Pascagoula, Miss.	40.0	10,099	5,892	8,346	2,553
Gulfport, Miss.	30.0	1,315	29	551	45
Lake Charles, La.	34.0	19,218	14,594	17,002	6,591
Baton Rouge, La.	40.0	47,017	13,702	18,453	7,883
New Orleans, La.	36.0	120,067	20,157	68,673	19,656
Port Arthur, Tex.	42.0	23,296	20,073	8,907	3,985
Beaumont, Tex.	33.0	30,980	23,275	11,836	5,929
Houston, Tex.	38.0	68,424	34,280	30,886	10,430
Texas City, Tex.	36.0	17,952	12,366	8,299	5,794
Galveston, Tex.	41.0	3,953	117	2,396	294
Freeport, Tex.	36.0	5,723	662	3,716	1,372
Corpus Christi, Tex. (incl. Harbor Island)	37.5	26,754	18,756	6,917	3,499
TOTAL 17 PORTS		438,486	178,552	214,916	71,746

1/ Waterborne Commerce of the United States - Calendar Year 1971 Part 2 Waterways and Harbors Gulf Coast, Mississippi River System and Antilles - Department of the Army, Corps of Engineers.

2/ Includes Crude oil, gasoline, jet fuel, kerosene, distillate fuel oil, residual fuel oil, lubricating oil and greases, and LPG.

3/ Somewhat understated as this column includes only tanker and tank barges and no tugs or towboats which are included in the preceeding column.

F. Conflict with Military Uses of the Continental Shelf

The Gulf of Mexico is used rather extensively by the Navy and Air Force for conducting military training, testing and research activities. These current activities consist of missile testing, ordnance testing, drone recovery operations, pilot training and electronic counter measure (ECM) activities by the Air Force. Mine research activities are conducted by the Department of Navy. Most of this activity takes place in areas designated for these purposes. However, live ordnance testing by the Air Force occasionally involves emergency release of ordnance outside designated bombing areas. These ordnances range from small munitions to 1200-pound bombs. The possibility of occurrence of unexploded munitions on the ocean floor in the proposed sale area is not remote in certain locations. Potential for interference with military training and testing activities and possible hazards of unexploded munitions are discussed below.

The area of most concern in terms of conflicts with testing and training activities is Defense Warning Area W-151 off the northwest Florida Gulf coast. Missile testing, ECM activities, low level supersonic flights and drone recovery operations are conducted in the area by Eglin and Tyndall Air Force Bases.

Negotiations between the Department of the Interior and the Department of Defense concerning elimination or reduction of potential interference the proposed sale would pose to military testing and training activities began in December, 1972 and were concluded on August 30, 1973. As a result of the conclusion of negotiations, 12 tracts in the Pensacola South No. 1 area, which were originally included in the draft environmental statement for this proposed sale, have been deleted from consideration. According to the Department of Defense, "this agreement permits examination and possible exploitation of the oil/gas in a major portion of the area concerned but without undue impact on DOD activities." (See Vol. 5, *Attachment I for DOD's Fact Sheet, dated September 12, 1973 which summarizes the potential impact this proposed sale will have on DOD activities.) Moreover, the DOD states:

> The only activity which may have to be moved are the two Navy underwater acoustic platforms of the Panama City Naval Coastal Systems Laboratory near Tyndall AFB. The number of employees that would be involved are approximately 10. Examination is now being made as to the most suitable place for relocation. If they must be moved the estimated cost of the move would be approximately $400K. (sic)

The agreement reached includes the application of stipulations which will be applied to 35 tracts 1/ in the Pensacola South No. 1 area in the event they should lease. The effect of these stipulations will be to:

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* 1/ See Vol. 5, Attachment C, Tract Nos. 67 through 101.

a. Hold the Government harmless from any sonic or Electromagnetic (EM) effect caused by the operation of military aircraft and emitters.

b. Hold the Government harmless from any damage accidentally caused regardless of altitude, by the operation of these aircraft and emitters.

c. Allow control of their own EM emissions to the degree necessary to prevent damage to, or unacceptable interference with, the DOD flight test activities. Eglin Air Force Base would effect the necessary monitoring, coordination with operators, and control in this regard.

d. Require each company operating boat or aircraft traffic into the Warning area to enter into an agreement with the Armament Development Test Center, Eglin Air Force Base, Florida, prior to commencing such traffic. The agreement will provide for positive control of boat and aircraft traffic operating into the Warning area.

Although the sale can proceed according to DOD "without undue impacts on DOD activities", the question remaining to be answered is what impact or hazards will DOD activities have on OCS operations and activities in the 35 tract, Pensacola South No. 1 area? We requested an evaluation from DOD of the probability of accidents that could occur due to the proximity of the subject 35 tracts to military training, testing and ordnance disposal areas. By letter dated October 10, 1973, DOD advised us that they can not provide a probability analysis of potential hazards before November 1, 1973. Therefore, at this time, we are unable to determine the hazard potential that DOD testing and training activities pose to OCS oil and gas development activities. When the information requested from DOD is received, it will be transmitted to the Secretary of the Interior's attention for consideration in his decision concerning the potential hazard these 35 tracts may pose to the environment. (See sec. III. K of this volume and Vol. 3, Sec. VIII. A.2 for considerations concerning these tracts).

In addition to the potential for interference with the military activities mentioned above, there is also a potential hazard from the release of hung ordnance in two "salvo areas" resulting in unexploded munitions on the ocean floor. Practice bombing is conducted on the military reserve at Eglin Air Force Base and occasionally ordnances fail to release. Two areas are set aside for the release and disposal of these ordnances, one for summer and one for winter. These areas are described as follows:

> A ten-mile-wide corridor along the western edge of W-151, beginning at a point 30 miles south of Santa Rosa Island and extending 63 miles south, is used during the winter months. Approximately one year ago, a salvo area for use during the

summer months was established 15 nautical miles east of the winter salvo area. These areas are depicted in figure 5.

When water ranges are used for jettisoning hung ordnance, the ordnance will be released armed. In the event of an emergency (for example, radio failure or flight problems) which precludes the use of a salvo area designated by ADTC, the flight will be cleared to drop ordnance on any water range.

Because Air Force procedures provide for dropping ordnance over water in the event of an emergency which precludes the use of a designated salvo area, potential hazards, however remote, exist in every tract within the defense warning area W-151. Such emergencies have occurred in the past, and ordnances have been jettisoned as far shoreward as Choctawhatchee Bay. No quantification as to the amount of ordnance located in and outside the salvo areas was available.

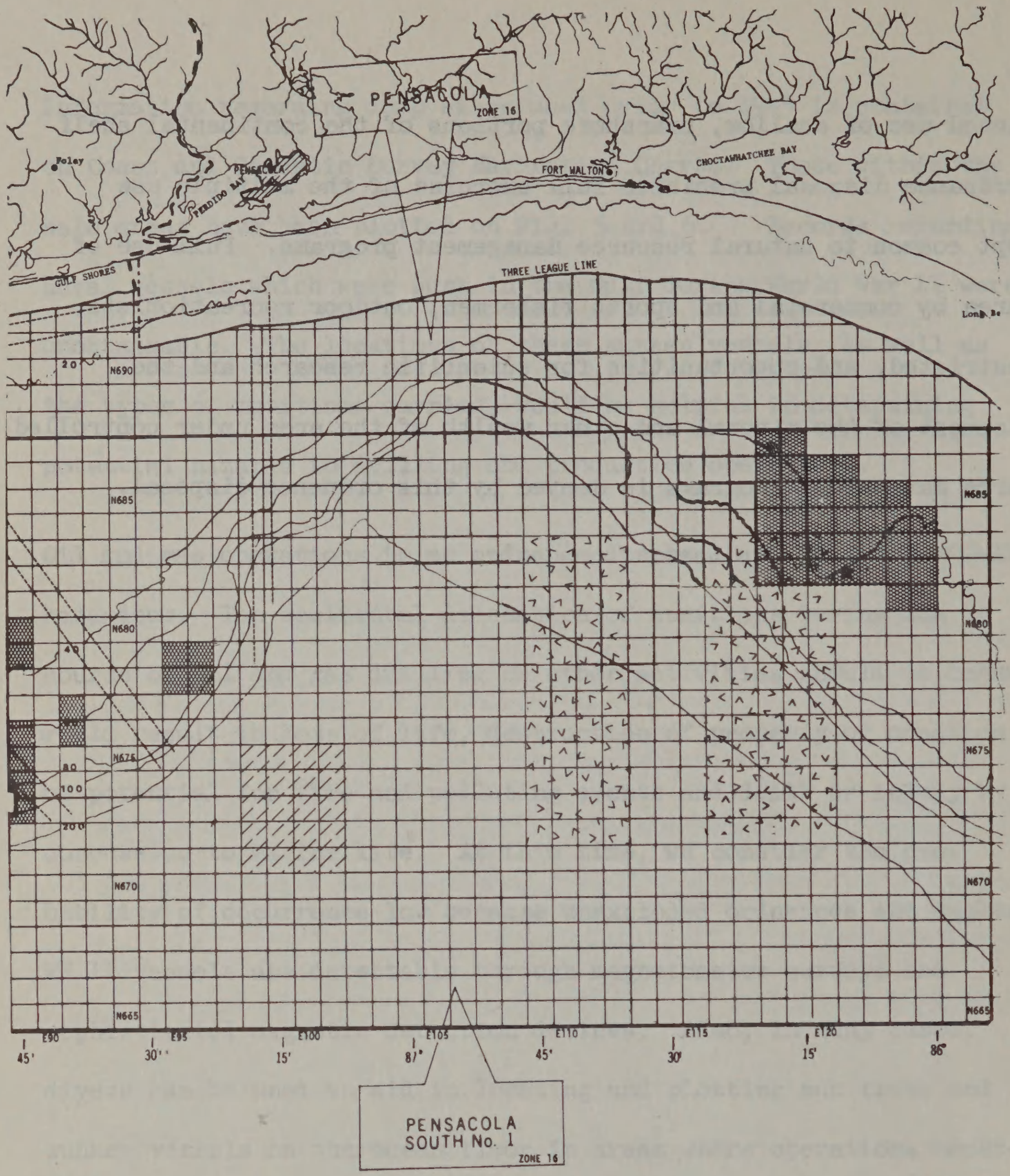
The Navy has conducted no munitions dumping in water less than 500 fathoms in depth since 1945 which would place their current dump sites well outside the area of concern. Additional information received from the Office of the Oceanographer of the Navy revealed that all deepwater dump sites used by the Navy are located off the Atlantic and Pacific coasts and that no sites are utilized in the Gulf of Mexico.

Information regarding dump sites used prior to 1945 is contained on Coast and Geodetic Survey Navigation Charts. Those within the sale areas have been plotted on Fig. 5 and 6. Records regarding naval vessels which were sunk in the Gulf during World War II were unobtainable. The locations of these sunken vessels, as well as the types of munitions carried, would be helpful in determining potential hazards to drilling and production operations.

Oil and gas operations in an ordnance disposal area are potentially hazardous. The accidental detonation of munitions during the course of oil and gas drilling or other activities should it occur would result in loss of life, destruction of property or creation of potential for fire and polluting events and death or injury by concussion to marine life. At this time, we consider the probability of occurrence low because unexploded ordnances and sunken WW II vessels are detectable through magnetometer surveys and sophisticated magnetic detection devices. Also, in many cases, divers can be used to aid in locating and plotting munitions and sunken vessels on the ocean floor in areas where operations necessitate contact with the sea floor.

Use of the active salvo areas for ordnance disposal should these areas be made available for oil and gas operations would have to be discontinued

Continued use of shallow, nearshore portions of the continental shelf for ordnance disposal prohibits full exercise of the multiple use concept common to natural resource management programs. Full use of the area by commercial and sports fishermen, outdoor recreationists, is restricted, and opportunities for scientific research and the development of the mineral and other wealth of the area under controlled resource management programs is denyed by this ordnance disposal.



▨ Munitions Disposal Area - Disused

★ Unexploded Depth Charge - Reported, 1956

⌐ Active Salvo Areas - Used by Eglin AFB

Figure 5 Relationship of Ordnance Disposal Areas to Tracts in Proposed Sale. (Orient to Leasing Plat Inserted inside back cover.)

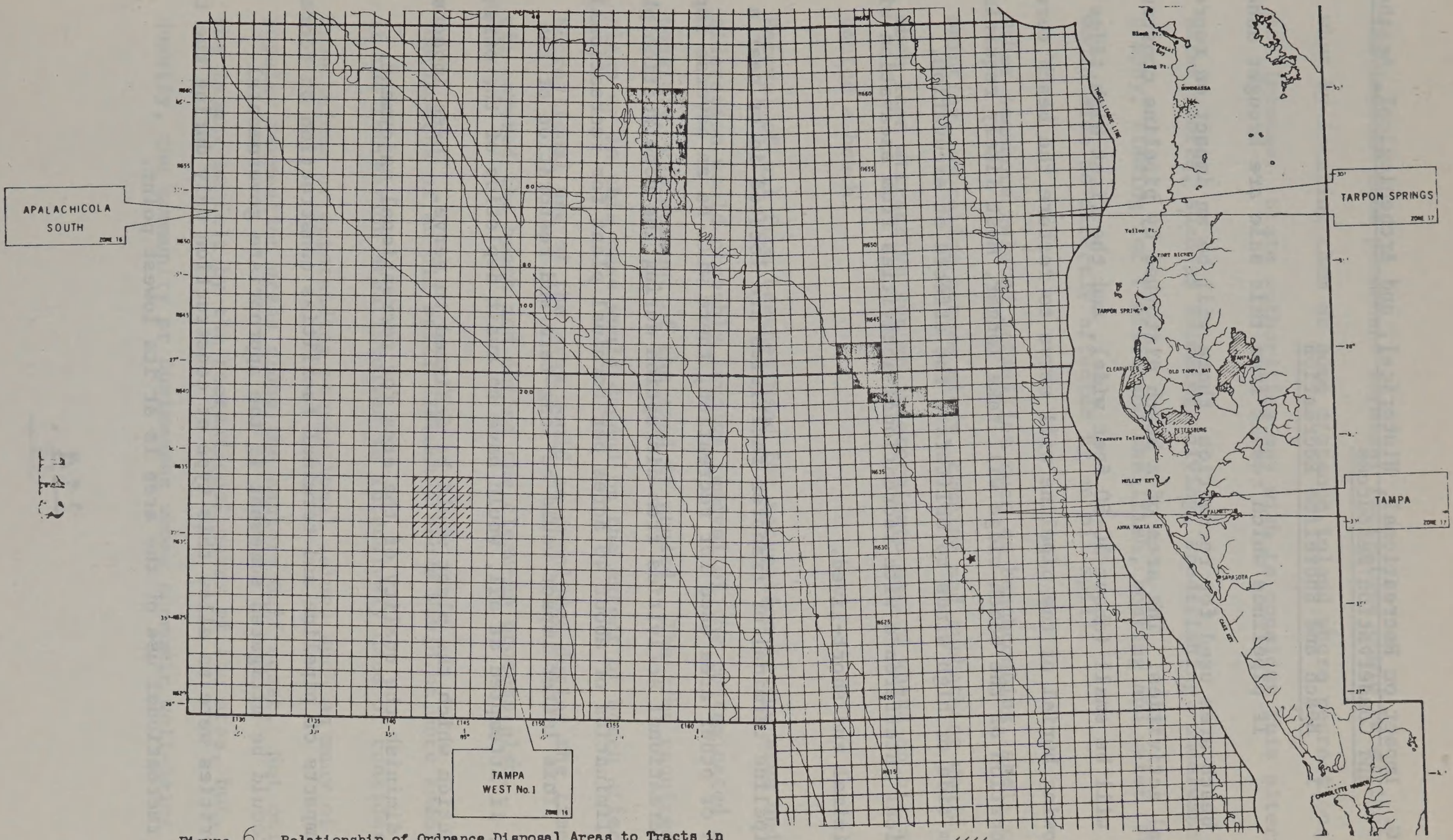


Figure 6 Relationship of Ordnance Disposal Areas to Tracts in Proposed Sale. (Orient to Leasing Plat inserted inside back cover of Vol. 5.)

//// Munitions Disposal Area - Disused

★ Unexploded Depth Charge - Reported, 1956

G. Impact on Recreational, Historical, and Archeological, Aesthetic and Conservation Resources

1. Beach and Shoreline Recreation

If pipelines which result from this sale are brought ashore in a beach area used for recreation, there will be an impact on recreational activities. The area of a beach disturbed by pipeline construction will be small (about 30-50 feet wide), and the first high tides following burial of the pipeline will serve to restore the beach terrain. Restoration of the beach ridge will take longer, most likely requiring a storm tide or high winds to obliterate the effects of excavation. Physical interference with recreational activities from excavation will be minimal and short-lived.

If pipeline terminal or transfer facilities are located in or near a beach or other area used for recreation, there will be an adverse impact on recreational activities from disruption during the construction phase and elimination of about 40 acres per terminal plant for recreational uses. This latter impact would be long-term and restoration of the area, if attempted at all, would have to await depletion of the offshore production which the plant would be designed to serve. These impacts will diminish the quality of the area for recreational enjoyment.

The impacts of pipeline and terminal facilities construction on recreation could be mitigated somewhat if the appropriate governmental authorities were to allow this type of construction only during the time when recreational use of the area is at its lowest point.

The impacts from permanent terminal facilities could be mitigated somewhat by locating them at some distance inland where recreational use is not intense. State authorities may wish to consider this alternative.

Water sports, such as swimming, diving, spearfishing, underwater photography, fishing for finfish and shellfish, boating and water skiing would also be directly affected by an oil spill.

Other seashore related activities such as beachcombing, shell collecting, painting, shoreline nature study, camping and sunbathing would be made much less attractive for an indeterminate period where an oil spill had coated a beach.

Removal of oil from beaches used for recreation in the area under consideration would probably involve removal of the contaminated sand and possibly, replacement of the sand if needed. The time required for clean-up in this case would depend on the extent of beach affected. Recreational use of the area would be precluded during the time that oil covered the beach and during the clean-up process also.

The impacts of an oil spill discussed above would be more keenly felt if the recreation area involved is intensively used or considered to have unique or outstanding recreational values such as many of the popular recreation areas along the eastern Gulf coast. Not only would the impact be felt by the recreational users of the area, but, consequently, the community or businesses whose economic well-being depends on use of their recreational resources by tourists would be affected. If an oil spill were to cover outstanding recreational beach during the height of the recreational season, the impact could be expected to be more severe, in that residents and tourists would not be attracted to a beach area contaminated by oil or undergoing a clean-up process, and there would be a resultant economic loss.

2. Aesthetic and Scenic Values

If air quality permits unlimited visibility, some portion of a one hundred foot structure can be seen from the beach if it is located 17 miles or less from shore. Some people consider the sight of offshore equipment aesthetically unpleasant. Seven of the 147 tracts included in this proposal are located at distances varying from 14 to 17 miles from shore, the shore in this case being that of the barrier islands off Mississippi, Dauphin Island, and the Chandeleur Islands. No structures will be visible from the mainland.

Any floating material such as debris or oil that is cast up on the beach or washed into a bay would constitute an impact upon the aesthetic values for users or owners of the area.

Even after burial of the pipeline, the scars will cause an impact on the aesthetic values of the beach and associated dunes and sand flats. It is our estimation that the impact will endure for at least a year, until sand has been redistributed by wind, and tides, and another growing season brings about revegetation.

Revegetation of dunes crossed by pipelines would reduce adverse effects from an aesthetic and scenic viewpoint and would decrease the chance of destruction of the dunes by erosion. It is not, however, within the Federal Government's authority to require the revegetation of affected dunes unless they are on Federal lands. State or local authorities may require revegetation of dunes disrupted by pipeline installations.

There will be an adverse impact on aesthetic and scenic values resulting from construction of onshore terminal and product storage facilities, and pumping stations if these facilities are located in areas valued for their natural or scenic qualities. Some people will find the visual impact of these facilities aesthetically displeasing. There also may be noise pollution associated with vehicular traffic to and from these facilities and noise pollution resulting from pumping stations that would reduce the serene and natural qualities of an aesthetically enjoyable area.

3. Historical or Archeological Sites and Objects

Impacts on these could stem from two sources. During an oil spill, any objects coated with oil would obviously be rendered less useful and valuable and may not survive cleaning operations. In addition, porous items such as wood, pottery, or shell may be internally contaminated with oil and this might interfere with carbondating procedures.

During pipeline burial operations or construction of terminal, storage, or pumping facilities, as yet undiscovered archeological sites or objects and shipwrecks may be damaged or destroyed. Normal pipeline route survey procedures usually include a magnetometer survey. In this way, all larger ferrous objects, including objects of historic or archeological value, are detected and avoided or investigated prior to actual laying operations. This survey would not reveal the presence of nonferrous objects, however. Therefore, it is likely that sites containing archeological evidence of cultures which did not make use of metal, i.e., the older, less well-known cultures, would not be detected by this method.

Special surveys of onshore facility site locations and pipeline routes would have to be taken before any assurance that sites and objects of historical or archeological interest might not be destroyed or damaged.

Pipeline burial operations have the potential for damage or accidental destruction of as yet undiscovered sites which may be important to the understanding of prehistoric inhabitants of the area. The scope of the impact and its probability of occurrence is not possible to determine at this time. The impact may be mitigated to some degree if the appropriate state authorities are consulted as to the exact locations of known archeological sites or potential locations for undiscovered sites before any construction or pipeline burial is undertaken. See Vol. 2; Sec. IV. D. 1. for a stipulation which will be applied to any lease resulting from this proposed sale for the protection of archeological, architectural, or historical values.

4. Conservation Resources

Included under this heading are the state and Federal wildlife refuges and management areas, aquatic preserves, natural landmarks and any other areas formally set aside for conservation of their natural values. There are a number of areas of this type adjacent to the coastline in the northeastern Gulf (Vol. 1, Sec. II. F. 2.).

The impacts of oil spills and pipeline and onshore facility construction on biota, air and water quality, beaches, etc., have been discussed previously. Should an oil spill occur in a conservation area, or should pipeline and onshore facility construction occur in one of these areas, the impacts discussed above will apply. In the event that impacts discussed previously do occur in a conservation area, the impact will not only be on the air and water quality, beaches, biota, etc., the impact will also be on the effort to preserve or protect a unique, representative, or otherwise significant natural value.

5. Sport Fishing

Although we have no conclusive evidence, it is our opinion that a major oil spill would effect sport fishing adversely. Boat fishermen would not want to soil their boats by fishing in the vicinity of an oil slick and neither boat nor surf fishermen would want to keep fish that had been coated or contaminated with oil. Therefore, sport fishing would be curtailed in the vicinity and for the duration of the spill incident.

We have received extensive testimony and evidence that overall, oil and gas operations have a favorable impact on sport fishing activities. The favorable impact is the result of sports fish population enhancement due to the artificial reef effect on offshore platforms. In the open sea, offshore platforms provide both food and cover in areas that are largely devoid of those essentials. Myriad forms of microorganisms in the water drift by these structures and attach themselves, soon encrusting all exposed surfaces on the platform. The average platform in 150 feet of water provides 90,000 square feet of hard surface for encrusting organisms 1/. Hard substrate is necessary for encrusting organisms such as barnacles, hydroids, corals, mussels, and other invertebrate organisms which serve as links in the food chain. Randall (1963)

1/ Information from Keith G. Hay, Conservation Director, American Petroleum Institute.

has stated that aritificial reefs provide protection, food sources, spawning sites, and spatial orientation markers for fishes. The same author found that artificial reefs attract available fish from surrounding waters, and increase the size of some populations by providing additional protected areas and food for both young and adults.

H. Land Use and Socio-Economic Effects of Onshore Development

1. Land Use Effects of Onshore Industrialization

The exploration for, and production of hydrocarbons from the areas proposed for leasing in this sale will require onshore development for the purposes of transport, storage, and supplying support services for offshore activities. The analysis presented here of land use impacts in the coastal zone is based on a more detailed staff report prepared by BLM's New Orleans Environmental Assessment Team. 1/

Any discussion of potential induced onshore land use impacts resulting from offshore oil and gas development must recognize the following factors:

(a) Onshore development will be determined by how the offshore reserves are developed. This will depend on the location and extent of recoverable reserves and the pattern of successful bidders resulting from the bid process. These factors cannot be accurately predicted at this time.

(b) Also to be recognized are the interrelationships among existing state and local land use and development policies, the location of existing onshore facilities, locational requirements of facilities resulting from this proposed sale, and the availability of lands suitable for development.

1/ New Orleans Environmental Assessment Team Report No. 5, "Land Use and Socio-Economic Effects of Mississippi-Alabama-Florida Outer Continental Shelf Oil and Gas General Lease Sale (No. 32)", October , 1973.

(c) OCS oil and gas operations result in onshore activities which are closely related to those activities resulting from the importation of crude oil, the possible development of deep water ports, and the existing oil and gas production in some of the Gulf states, both onshore and offshore. Large petroleum-related industries in Texas and Louisiana will play a large role in supplying production platforms, exploratory rigs, pipeline construction equipment and other needed equipment necessary for the development of any leases resulting from this proposed sale. Likewise, refinery capacity available in Texas, Louisiana, and Mississippi will be used for processing production from the proposed sale.

The following discussion on land use impacts resulting from industrialization induced by this proposed sale is essentially an attempt to portray how and where industry's expressed plans for onshore development will affect existing land use patterns and State or regional land use policies in Mississippi, Alabama, and Florida. At this point, it must be noted that industry's assumed onshore development plan is an estimate of locational and facility requirements made by industry and is not a finalized plan (See New Orleans EAT Report No. 5).[1/]

a. Assumed Onshore Development Plan

Specifically, this section will treat the acreages and locations required onshore by pipelines and onshore facilities including

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[1/] Land Use and Socio-Economic Effects of Mississippi, Alabama, Florida OCS Oil and Gas Lease Sale (No. 32), October, 1973.

gas separator facilities, support facilities, oil pipeline terminal facilities, and storage and tanker facilities. Table 11 indicates the total acreages required for these facilities on an eastern Gulf-wide basis. Calculations of these acreages were based on industry's estimates and the assumption was made that if several lessees own leases in the sale area, the lessees will cooperate in locating onshore facilities in order to minimize acreage requirements.

Figure 7 is a schematic portrayal of the expected locations and types of onshore development which may result from this proposed sale. The sum of all possible onshore facilities and feasible alternatives are shown. Locations of facilities can only be approximated at this time, based on the anticipated routes and modes of transportation of production from the production areas of the sale (Fig. 8, Sec. I) which have been discussed in Vol. 1, Sec. I. F. 4. d. Since alternatives have been included, there is some duplication of facilities in this portrayal.

Table 12, which is keyed to Figure 7, lists those pipelines and onshore facilities required by each production area and estimates the acreage requirements for the localized onshore areas. Acreages required by pipeline rights-of-way have not been given for the following reasons: (a) the width of the right-of-way purchased or leased for a pipeline may vary from place to place due to variance in legal or land use policies and the type of land to be traversed; (b) the width of the path of disruption by excavation and installation equipment may also vary due to the type of terrain which must be traversed.

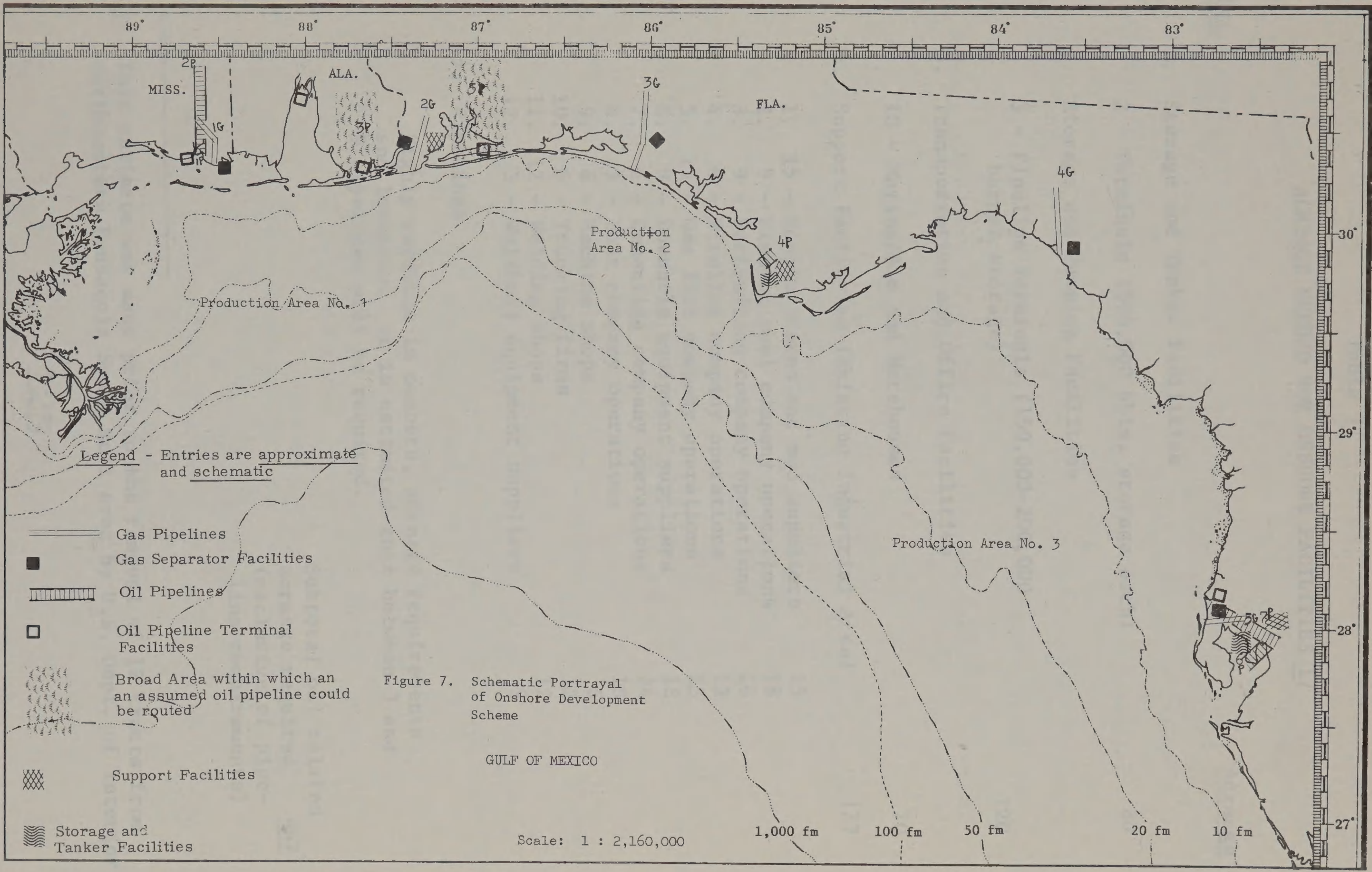

Figure 7. Schematic Portrayal of Onshore Development Scheme

Table 11

ACREAGE NEEDED FOR ONSHORE FACILITIES 1/

OIL		Acreage
1. Storage and Tanker Facilities		
2 - Terminals (500,000 bbls. storage each)		80
2. Storage and Pumping Facilities		
3 - Pipeline Terminals (150,000-200,000 barrel storage)		120
3. Transportation and Office Facilities		
10 - Marine/Air and Warehouses		70
4. Support Facilities (Existing Industrial Area)		177
1. 15 - Supply Stores and mud suppliers	15	
2. 9 - Fishing tool company operations	18	
3. 9 - Perforating company operations	18	
4. 6 - Wireline company operations	12	
5. 15 - Gas lift company operations	15	
6. 9 - Downhole equipment suppliers	18	
7. 6 - Cementing company operations	24	
8. 9 - Boat company operations	18	
9. 6 - Machine shops	6	
10. 6 - Trucking firms	12	
11. 12 - Welding shops	12	
12. 3 - Wellhead equipment suppliers	9	
5. Pipelines		
Highly variable in numbers, acreage requirements and location. It is estimated that between 3 and 9 pipelines will be required.		
Subtotal oil related acreage required (exclusive of pipeline requirements)		447

1/ This estimate was made prior to the removal of 12 tracts from northeastern Pensacola South No.1 area by U.S. Dept. of Interior.

Table 11 (cont')

GAS	Acreage
1. Separator Facilities	
3 Facilities	
2. Pipelines	
Three pipelines are assumed.	
Subtotal Gas related acreage required (exclusive of pipeline requirements)	24
TOTAL GAS AND OIL ACREAGE REQUIRED (exclusive of pipeline requirements)	471

Table 12

ASSUMED AND ALTERNATE TYPES AND LOCATION OF ONSHORE FACILITIES
(Numbers Shown Key to Fig. 7)

Gas Pipelines (A total of 3 is anticipated, 1 to service each production area, the most likely locations for which are as follows)

Production Area #1
No. 1G 18.0 onshore miles

Production Area #2 (One of these two alternates would be used)
No. 2G 14.5 onshore miles
No. 3G 30.0 onshore miles

Production Area #3 (One of these two alternates would be used)
No. 4G 18.0 onshore miles
No. 5G 8.3 onshore miles

Gas Separator Facilities (1 required at each of the 3 anticipated pipeline landfalls)

One each, per pipeline landfall, 8 acres each

Oil Pipelines (A total of from 3 to 9 are anticipated, the most likely locations for which are as follows)

Production Area #1
No. 1P (This alternative assumes that the crude oil is refined in Pascagoula)
2 onshore miles
No. 2P (This alternative includes the additional pipeline required if the crude is piped to existing interstate lines north of Pascagoula)
33 onshore miles

Production Area #2
No. 3P (This assumes alternate "(a)" (Vol. 1, Sec. I. F. 4. d. 2. iii.)
43 onshore miles
No. 4P (This assumes alternate "(b)" (Vol. 1, Sec. I. F. 4. d. 2. iii.)
2 onshore miles
No. 5P (This assumes alternate "(c)" (Vol. 1, Sec. I. F. 4. d. 2. iii.)
43 onshore miles

Production Area #3

No. 6P (This assumes that the crude is piped directly to facilities in the Tampa region)
6 onshore miles

No. 7P (This alternative assumes that the offshore pipeline landfalls near Tarpon Springs, from where it is piped overland to storage and tanker facilities in the Tampa region)
15 onshore miles

Transportation and Office Facilities

The 10 listed sites of 7 acres each are assumed to develop as needed in presently industrialized areas throughout the eastern Gulf. Because of the snall acreages involved, they were not plotted.

Support Facilities

Production Area #1

Venice, La., vicinity (not portrayed)	57 acres

Production Area #2

Port St. Joe, vicinity	40 acres
Pensacola, vicinity	40 acres

Production Area #3

Tampa-Tarpon Springs, vicinity	40 acres

Oil Pipeline Terminal Facilities

(To be used for crude transshipment, as needed, to tie with other pipelines, barges, tankers, etc.)

No. 1 Mobile-Pascagoula, vicinity	40 acres
No. 2 East or West of Pensacola, vicinity	40 acres
No. 3 Tarpon Springs, vicinity	40 acres

Storage and Tanker Facilities

No. 1 Tampa Bay, vicinity	40 acres
No. 2 Port St. Joe, vicinity	40 acres

b. Land Use Impacts

Land use requirements have been limited in this analysis to land required by industrial development. This industrial development, however, will in turn introduce new employees, families, and money into the areas with resultant additional land use and socio-economic effects. It will be the responsibility of state or local planning authorities to allocate lands and guide development of both onshore industrialization induced by this proposed sale and its more far-reaching land use and socio-economic impacts.

Mississippi

In analyzing the land use impacts of onshore development, the existing land use policies of the regions to be affected were consulted. In the case of Mississippi, the Regional Land Use Plan for Harrison, Hancock, Jackson, and Pearl River Counties, Mississippi (Gulf Regional Planning Commission, 1971) was used as a basis for analysis. This plan is "considered as a statement of general policy that will serve to optimize benefits derived from the use of land in support of the regional economy and population" (Gulf Regional Planning Commission, 1971).

In the Pascagoula region, a large acreage has been identified by this plan for future industrialization on the basis of site suitability, ease of access, keeping use of tidelands to a minimum, and consideration for compatibility with existing or proposed urban uses. Facilities resulting from this proposed sale, gas pipelines, gas separator facilities, oil pipelines and terminal facilities, will be located in the Pascagoula region. It appears that these facilities will conform to the use patterns of the area, and the acreage requirements will pose no stress on existing or projected land use.

Should the indicated oil pipeline north of Pascagoula be required, it would traverse lands projected generally as "Forestry and Agriculture" and no land use conflict is anticipated.

No additional requirements for storage or tanker facilities were indicated in the assumed offshore development plan for this area, because of the existing port facilities relating to the refining industry which could be utilized if needed.

Alabama

The possible land use impacts in Alabama were analyzed using as a basis the Regional Development Plan - 1995 (South Alabama Regional Planning Commission, 1971). Their projected regional design recognizes and accepts "those conditions and characteristics of the region's structure which have related permanence such as the Bay, delta, marshlands, islands and some of the existing developments."

Their projection of acreage requirements indicates large acreages to be used for industrializtion, 60 acres specifically petroleum industry-related. Therefore, the possible building of a 40 acre pipeline terminal facility in the Mobile area should cause no stress on anticipated land use in this area.

In Baldwin County, the regional plan indicates no industrial acreage by 1995, should a pipeline and terminal facility be required. A nearly continuous band of "Permanent Open Space" along the shoreline of the county is proposed. This may present land use conflicts should it be found necessary to bring a pipeline ashore here or to build a 40 acre terminal facility. Figure 7, however, indicates that the site requirements for this pipeline are not specific. It may be possible, therefore, through subsequent site studies, to determine a least disruptive route for a pipeline within this broad area.

As was the case for Pascagoula, no additional storage or tanker facilities were assumed for Mobile, because of the existing port facilities which could be utilized.

Florida

The primary source used in determining impacts of onshore facilities on Florida's land use patterns and policies was the Florida Coastal Zone Management Atlas: A Preliminary Survey and Analysis (Florida Coastal Coordinating Council, 1972). Only lands designated by this atlas as being in the "Development Category" and more specifically as being "(1) areas already developed" and "(2) undeveloped areas now vacant or used for other purposes, including forestry and agriculture, which are intrinsically suitable for intensive development" were considered generally capable of hosting the types of onshore development which may occur as a result of this proposed sale without causing undue stress to existing and projected land use.

The following discussions relate the assumed development shown on Fig. 7 and Table 12 to the capabilities of these regions to host onshore development.

Pensacola Region (Escambia County)

Facilities which may be placed in the Escambia County region include a gas pipeline, a gas pipeline separator facility (8 acres) and a support facility (40 acres). In this area, already commercially developed, there are large acreages in the above mentioned "Development Category". The additional potential development requiring 48 acres and a pipeline route should not impose a stress on existing or proposed land use in this area.

Santa Rose and Okaloosa Counties

In this area, an oil pipeline and terminal facility (40 acres) may be needed, however locational requirements, as indicated on Fig. 7 are not specific. Lands in the "Development Category" in this area exist in sufficiently large acreages to host a pipeline terminal facility and the flexibility of locational requirements for the pipeline should allow for a route to be selected which would be compatible with existing land use patterns.

Walton and Bay Counties

As most of the land near the locations which are assumed for the gas pipeline and separator facility (8 acres) which may be placed in this area are in the "Development Category" it appears there would be no land use conflict caused by these facilities.

Port St. Joe Region

In this area, an oil pipeline, support facilities (40 acres) and storage and tanker facilities (40 acres) may be needed. Florida Coastal Coordinating Council (1972) shows few opportunities for futher development from a land use standpoint. There are, however, scattered acreages of land near the water in the "Development Category". Detailed site studies would be required to determine whether there would be sufficient acreage available for development of these facilities without causing land use conflicts.

Taylor County

A gas pipeline and a separator facility (8 acres) may be required in this area. However, there is no acreage along the shoreline which is considered suitable for development. This may lead to a land use conflict concerning a pipeline landfall. A short distance inshore, there are large acreages in the "Development Category" which could host a gas separator facility.

Tarpon Springs-Tampa Region (Pasco, Pinellas, and Hillsborough Counties)

In the Tarpon Springs area, an oil pipeline, oil pipeline terminal facilities (40 acres), a gas pipeline, a gas pipeline, and gas separator facilities (8 acres) may be needed. In the Tampa area, a short length of oil pipeline (as an alternate to the pipeline and terminal facilities in Tarpon Springs),support facilities (40 acres), and storage and tanker facilities (40 acres) may be needed.

The Tarpon Springs-Tampa area is a highly developed industrial and population center. In the Tarpon Springs area' large acreages of development lands along the coast and inland should be able to host the assumed pipelines and terminal facilities without land use conflict. Similarly, in the Tampa area, large acreages of development lands exist which offer opportunities for the further development required by support facilities. Storage and tanker facilities, if needed, would necessarily have more specific site requirements. At this time, it cannot be determined whether present acreage existing within the port area could accomodate additional facilities required by this proposed sale. If new acreages are required, however, there are lands designated as suitable for development throughout the area which could be used for these facilities without land use conflicts.

c. Other Effects

Onshore industrial development resulting from this proposed sale will result in impacts other than those on land use. Before these impacts can be realistically analyzed, it is necessary to know precise site locations, the precise kinds of equipment to be installed in each facility, plans for waste disposal at each site, numbers of vehicles to be used and how often, and the amounts of power and water to be used. None of these factors will be accurately known until final plans are made concerning the construction and operations of each facility. Site locations for onshore facilities will ultimately depend on state or local zoning and planning policies. Similarly, Federal, State, or local laws will apply concerning the emission of disposal of any pollutants from these facilities.

2. Impact on Socio-Economic Conditions

a. Effects of Oil and Gas Development 1/

Section I.F.6. of this statement described a potential timetable for the development of the oil and gas resources of the MAFLA sale area. The following tables (13 , 14 , and 15) show the expected expenditures and employment for the different stages of development, (exploration, development well drilling and production stages.) These estimates are primarily based upon industry experience offshore Louisiana. The data is broken down to show how much of the expenditures will occur in the MAFLA region. The tables also show what part of the required labor force will be taken from and/or will maintain residence within the region. Table 16 shows the capital investment which can be expected to occur as a result of the proposed sale. Most of the capital expenditures will occur outside the region.

1/ Information used in this section has been taken from, New Orleans Environmental Assessment Team, Staff Paper No. 5, "Land Use and Socio-Economic Effects of Mississippi-Alabama-Florida Outer Continental Shelf Oil and Gas General Lease Sale (No. 32)." October, 1973.

Generally, onshore economic inducements from oil production relate to expanded refinery and petro-chemical capacities and production. Past offshore oil production has resulted in increased requirements for refineries and petro-chemical industries. However, proven onshore and offshore reserves have peaked in the Gulf of Mexico region and production is expected to peak and begin to decline in the near future. Any production resulting from this sale will likely be used to offset declining production from other areas. Therefore, no new refinery construction is expected to occur in the MAFLA region as a result of this sale.

Table 13

Exploratory Well Drilling 1/

Expenditures (Average $/Year)

	Local 2/	Non-Local	Total
Salaries	$14,882,000	$10,655,000	$25,537,000
Equipment Rentals	6,132,000	60,837,000	66,969,000
Purchases and Services	17,840,000	51,869,000	69,709,000
Total	38,854,000	123,361,000	162,215,000

Labor Force	Hired Locally	Transferred In	Total
Oil Company Employees	0	79	79
Contract Employees	1,282	1,144	2,426
Total	1,282	1,223	2,505

No. of Employees Maintaining Residence	1,440
No. of Employees Not Maintaining Residence	1,065
Total	2,505
Net Inflow of Employees	158

1/ Exploratory well drilling will begin soon after the sale and continue for about four years.

2/ "Local" refers to either the general sale area, or to a specific location within the area.

Table 14

Development Well Drilling 1/

Expenditures (average $/Year)

	Local 2/	Non-local	Total
Salaries	$26,677,000	$17,650,000	$44,327,000
Equipment Rentals	10,149,000	30,327,000	40,476,000
Purchases and Services	31,851,000	96,477,000	128,328,000
Total	68,677,000	144,454,000	213,131,000

Labor Force	Hired locally	Transferred In	Total
Oil Company Employees	0	166	166
Contract Employees	2,858	2,403	5,261
Total	2,858	2,569	5,427

Employees Maintaining Residence	3,190
Employees Not Maintaining Residence	2,237
Total	5,427
Net Inflow of Employees	332

1/ Development well drilling will begin near the end of second year and continue into the ninth year.

2/ "Local" refers to either the general sale area or a specific location within the area.

Table 15

Production Operations

Expenditures (average $/Year) 1/

	Local[2]	Non-Local	Total
Salaries	$54,298,000	$ 6,048,000	$60,346,000
Equipment Rentals	25,334,000	5,645,000	30,979,000
Purchases and Services	22,428,000	9,828,000	32,256,000
Total	102,060,000	21,521,000	123,581,000

Labor Force	Hired locally	Transferred In	Total
Oil Company Employees	1,064	1,512	2,576
Contract Employees	2,688	672	3,360
Total	3,752	2,184	5,936

Employees Maintaining Residence	5,264
Employees Not Maintaining Residence	672
Total	5,936
Net Inflow of Employees	1,512

1/ This total annual dollar flow will reach this peak in the eighth year from start of drilling first well. The flow of production dollars will gradually increase from the third to a maximum in the eighth year and continue through the fifteenth and gradually decline.

2/ "Local" refers to either the general sale area or a specific location within the area.

Table 16

Capital Investment 1/
($Millions)

Platforms - 112 @ $6.0	$672.0
Pipelines - 1100 miles	155.0
Pipeline Terminal - 3 @ $1.5	4.5
Tanier Terminal - 2 @ $5.0	10.0
Wells - Exploratory (112 - Productive)	204.0
(262 - Dry)	445.0
- Development (1512 - Productive)	1,186.9
(168 - Dry)	95.3
Total	2,772.7

1/ The estimates of platforms, pipelines, and other facilities were made by industry representives and are not necessarily the Department of the Interior's estimates.

The regional economic impacts, will relate primarily to directly increased payrolls of employees in the basic petroleum industries, induced employment gains in related industries, outlays for purchases of materials and services, etc. These first-round expenditures would then stimulate an increase in consumer and business purchases in other sectors of the economy. The economic stimulation should have an effect on the eastern Gulf in general, however, the degree of impact will be highly variable within the region.

The economic impacts associated with the exploration and developmental drilling phase will occur soon after the sale, but they will be of relatively short duration while the impacts associated with the production phase will occur later but will provide benefits on a more sustained basis. The expenditures that will be made in the local region are time-lined in Table 17. The cumulative regional impact varies between years due to the overlapping of activities, with the eighth year showing the highest total expenditures.

Table 17

Total Flow of Money into Local Economy
($Millions)

Year	Exploratory Phase	Development Well Drilling	Production	Total
1.	38.8	-	-	38.8
2.	38.8	17.2	-	56.0
3.	38.8	68.7	17.0	124.5
4.	38.8	68.7	34.0	141.5
5.	-	68.7	51.0	119.7
6.	-	68.7	68.0	136.7
7.	-	68.7	85.0	153.7
8.	-	68.7	102.0	170.7
9.	-	27.5	102.0	129.5
10.	-	-	102.0	102.0
11.	-	-	102.0	102.0

Through the multiplier effect, the eventual regional economic activity stimulated by the development of these tracts should be greater than the original expenditures for salaries and goods and services. This effect is highly dependent on the characteristics of the activities and the economic unit. Typically, a dollar introduced into a small community with low service capabilities will leave quickly and have little in further effect. Larger communities which are able to retain and recirculate new dollars will experience a greater multiplier effect. Since this discussion applies to a large and diversified region, a constant multiplier of 3:1, which is applicable to the activities of a typical oil field operation, is assumed. Thus, during the eighth year the total economic import on the region would be $512.1 million.

One indicator of the social impacts of the development of these tracts is the increase in population that will result from an inflow of workers. Tables 13 through 15 indicate the expected net inflow of workers into the region. The exploration phase is expected to result in an inflow of 158 workers; the developmental drilling phase, 332; and the production operations phase, 1,512. Using an employment/population ratio or "participation rate" of

40%, the total increase in workers and their families will be: exploration, 395; developmental drilling, 830; production operations, 3,780.

This increase in jobs in the region will require an increase in certain "service" or "support" jobs, such as retail sales and personal services. For each of the newly created "basic" jobs, it has been assumed that 1.5 "support" jobs will be created. The increases in support jobs in each stage, therefore, would be: exploration, 2,160; developmental drilling, 4,785; production operations, 7,896. These jobs could be filled with local people or by an additional inflow. If all these jobs were filled by someone from outside the region the increase in population related to the support jobs for the exploration phase would be 5,400; developmental drilling, 11,962; and production operations, 19,740.

The maximum possible population increase will occur during the production phase and will be about 23,520. To put this induced population in perspective, the 1970 population of the five BEA areas was 4.3 million with a projected 1980 population of 5.0 million, an increase of 700,000. The additional increase stimulated should not create, therefore, social or economic stress in the region as a whole.

The discussion to this point has been directed to the social and economic impact on the entire MAFLA region. The local economic and social impacts are largely a factor of, and inter-dependent with, the local distribution of industrial facilities. Allocation of gross regional socio-economic impacts to specific areas is highly speculative and unreliable. It has generally been assumed that most of the induced industrial development will be in or near existing industrial and population centers. It follows that the resulting socio-economic impacts will take approximately this same pattern.

b. Cost of Large Oil Spills

The cost of an oil spill coming ashore depends on the actual amount, character, and location of the coast affected the characteristics of the oil spilled; the time of year; wind, tide, and weather conditions. This cost may be examined in light of the spill off Santa Barbara, an area with high-value, intensive recreation development similar to that of much of the MAFLA area. A comprehensive study of the economic impact of this spill was done by Meade and Sorenson.[1/] They discuss the different components of the cost of a spill, including (1) clean-up cost and property damage (2) damage to tourism; (3) damage to the commercial fishing industry; (4) decline in shore front property values.

The study estimates that the direct cost of clean-up to industry and government was $11.1 million, of which the oil companies bore $10.5 million directly. The authors concluded that the spill had little net effect on volume of regional tourist trade; tourists were largely diverted to other (regional) areas and losses of beach front motels and restaurants were offset by gains in other areas.

Investigations of the Santa Barbara spill, according to Meade and Sorenson, have not revealed any economically sizeable effects on commercial fish species. The economic effect of the spill was

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[1/] Meade, Walter and Sorenson, P., "The Economic Cost of the Santa Barbara Oil Spill," Proceedings Santa Barbara Oil Symposium, December, 1970. The discussion of this study is taken from the Georges Bank Petroleum Study, MIT, February 1, 1973, Volume I, pp. 239-49.

due largely to a boom placed across Santa Barbara harbor for a month, trapping about 75 boats inside. After the boom was lifted, fishermen couldn't see the fish because of the slick, and fish caught were coated with oil from the slick as they were pulled out, and couldn't be sold. The total loss to local fishermen was estimated at slightly over $800,000, including an estimated $100,000 in uncompensated property damage. Despite this, fish landings at Santa Barbara for the entire year 1969 reached a record high.

With regard to sport fishing, the California Department of Fish and Game reported that the number of fish taken from party boats operating out of Santa Barbara declined during the period February to July, 1969, when reported landings were only 10 percent of landings in the same months for the previous few years. However, the Department concludes that the major part of this decline is related without doubt to the lack of fishing effort because of the adverse publicity of the oil spill and the closing of the Santa Barbara harbor.[2/]

According to the Meade and Sorenson study, the consensus among local real estate dealers and assessors was that the volume of beach-front sales declined sharply in 1969 and 1970 and that property values in certain areas declined 15 to 25%, and property

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[2/] This conclusion is endorsed by Dr. Dale Straughn in Biological Studies of the Santa Barbara Oil Spill, in Santa Barbara Channel Region Revisited. American Association of Petroleum Geologists Guidebook, Field Trip 3, 1973 Annual Meeting, p. 10. She writes, "In general the decline in fish landed in the period after the oil spill was probably due to closure of the Santa Barbara Harbor due to oil, and the fact that no one wants to fish in oily water."

values not in the immediate area of heavy oil fouling were not affected. However, the local dealers felt that the decline in property market values was only temporary and would disappear in about five years. The study calculated that the loss suffered in terms of foregone rental income amounted to about $40,000 per shorefront mile affected.

The total national cost of the Santa Barbara oil spill, as estimated by Meade and Sorenson, was about $6.4 million, which is equivalent to about $5.00 per gallon of oil spilled. Locally compensated losses amounted to 2/3 of the total estimated cost.

I. A Matrix Analysis of Some Possible Adverse Impacts on the Environment and Related Uses

In this section, a matrix system is introduced for the purpose of identifying and analyzing on a tract-by-tract basis those factors resulting from the proposed sale which could impact on the environment and which lend themselves to such an analysis. The matrix itself is simply a device used for displaying the interrelationships of some of the impact-producing factors (on the horizontal axis of each matrix) with coastal activities and resources which could sustain an impact (on the vertical axis of each matrix) and for assigning values to these interrelationships.

1. Purpose - The purpose is to analyze some of the possible impacts of the proposed OCS lease sale on the environment using a matrix analytical technique in an attempt to provide the decision-maker and reviewer with an array of factors which must be considered in order to form value judgments concerning the importance of these impacts to the environment.

2. Significant Resource Factors - The matrix analysis examines major factors which could sustain negative impacts as a result of the development of the tracts included in the proposed lease sale. Significant resource factors appear on the vertical axis of each matrix and for purposes of this analysis have been identified and placed into two groups as follows:

a. Natural Resource System

Refuges/wildlife management areas 1/

Unique and highly productive area 2/

Biota seaward of estuary/nursery areas

Beaches

b. Coastal Activities/Multiple Uses

Shipping

Recreation (boating, swimming, water oriented activities other than sport fishing)

Commercial fishing

Sport fishing

Ordnance Disposal Areas 3/

3. Impact-Producing Factors - The matrix includes two major categories of factors which can impact on significant resources (i.e., natural resource systems, and coastal activities) as a result of the development of proposed OCS oil and gas leases. The Impact-Producing Factors appear on the horizontal axis of each matrix and have been identified as follows:

a. Structures (e.g., platforms, fixed structures and artificial islands)
b. Oil spills

1/ Includes parks, sanctuaries, historical landmarks, etc.

2/ Includes marsh, estuary, and nursery areas.

3/ The reviewer should be aware of the caveat that some level of hazard due to interference with military training and testing activities exist for 35 tracts in the Pensacola South No. 1 area. However, detailed and precise data concerning the nature and scope of this hazard is needed in order to analyze it in the matrix context. These data are not available at this time (see section III. F.). Therefore, final judgment concerning the potential harm these tracts pose to the environment can not be made at this time, but in the interest of safety they are considered hazardous (see section III. K. 1.).

Other impact-producing factors such as debris and pipeline construction cannot be analyzed on a tract-by-tract basis and therefore are not included in this matrix section. However, these and other factors were discussed on the basis of the entire sale earlier in the statement.

4. Analytic Procedures - Each impact-producing factor is analyzed on the basis of (A) its potential magnitude and persistence which we have termed its importance, and (B) its proximity to high value resources or coastal activities/multiple-uses. A series of scales have been devised for the purpose of assigning a range of values consisting of importance and proximity to each impact-producing factor. These scales together with definitions and discussions are presented below.

(A) IMPORTANCE

a. Structures:

Under some conditions, offshore structures have an adverse effect on commercial fishing activities. Depending on currents and underwater obstacles an offshore structure can remove areas of trawling and purse seining waters. Heavy concentrations of platforms can make trawling and purse seining difficult.

Oil and gas platforms pose a hazard to commercial fishing and boating in general. Directional drilling from outside shipping lanes, however, can be used to develop tracts lying partially in shipping lanes.

An estimate of the importance of the impact of structures on the environment consists of two factors: 1) quantity--in this case it is estimated that all tracts 5,000 acres or more in size will average three structures per tract, even though some tracts may never be developed, and 2) time--all structures will remain on site for an average period of 15 to 20 years.

b. Oil Spills:

The same two factors for estimating the importance of oil spills on the environment are as follows: 1) quantity--our analysis is based on all spills of 1,000 bbl. or more, and 2) time--based on past experience the oil itself may remain in contact with, or a hazard to, the environment for a period of 1 to 90 days.

A scale (Table 18) indicating the importance structures and oil spills pose to significant resources or coastal activities/multiple uses follows:

Table 18

SCALE OF IMPORTANCE

100 - Oil spills: complete destruction of a resource within the immediate area of a spill, impossible to remedy or control; Structures: permanent obstruction and disruption of coastal activities/multiple uses.

80 - Oil spills: very hazardous to life and extremely difficult to remedy; Structures: very inconvenient interference with coastal activities/multiple uses.

60 - Oil spills: hazardous to plant and animal life and costly to remedy or control; Structures: inconvenient interference with coastal activities/multiple uses.

40 - Oil spills: unsightly and potentially hazardous to plant and animal life but relatively easy to remedy or control; Structures: some minor inconvenience to coastal activities/multiple uses.

20 - Oil spills: unsightly; Structures: slight inconvenience.

0 - No adverse effect.

(B) PROXIMITY

Each tract is assigned a proximity number, based on its distance from shore or high-value resources.

A vector analysis consisting of nearshore current direction and velocity, and wind direction and velocity data in the study area would be necessary to construct an oil spill simulation model. Unfortunately, reliable and extensive nearshore surface current data are not available for the study area. However, observations of oil slicks indicate an average drift rate at approximately 3% of the surface wind speed in the direction of the wind. 1/ Therefore, this simple formula will be applied to the extensive wind data available for the Northeastern Gulf of Mexico (see Attachment F) for monthly wind patterns based on records dating back as far as 1858) for the purpose of estimating the shoreward rate of drift of an oil slick. 2/ This in turn will serve as a basis for assigning proximity values to each tract in terms of its relation to shore or high value, vulnerable resources. It should be emphasized that the estimated direction and rate of oil slick movement is an approximation of the driving force exerted upon an oil slick by the wind. It does not consider slick geometries, natural dispersive forces, evaporation, absorption, dissolu-

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1/ The 3% figure is an order-of-magnitude figure which, in our estimation is more representative of the open ocean than are some of the values reported in the literature pertaining to confined bays or semi-enclosed waters.

2/ A shoreward rate of drift is the single most important factor involved in estimating time and possible impact points of an oil spill on nearshore or onshore high value, vulnerable resources.

tion or emulsification rates, and other forces that could cause cessation of the spreading movement of a slick.

The wind rose data in Attachment F indicates that the critical months for a possible shoreward slick movement in the New Orleans and Pensacola areas would be March, April, May and June, and in the Apalachicola area it would be June, July, August and February. An oil slick in the New Orleans area during these months would move at an estimated rate of 0.3-0.36 knots in the direction of the shore (i.e., north by northwest) at a 30-35% frequency. An oil slick in the Pensacola area during these same months would move at an estimated rate of 0.3-0.4 knots in the direction of the shore (i.e., north by northwest) at a 35-45% frequency. And, an oil slick in the Apalachicola area during the months identified above would move at an estimated rate of 0.2-0.45 knots in the direction of the shore (i.e., east by northeast) at a 15-27% frequency. The probability of an oil slick reaching shore is lower during the months of September, October, November, December and January then it is during the spring and summer months.

For purposes of analyses we have established a proximity scale which is based on the following assumptions:

a) An oil spill of 1000 bbl. or more has occurred.

b) The rate of shoreward drift of an oil spill in the study area under normal conditions is estimated at 0.3-0.5 knots. For purposes of this analysis the 0.5 knot rate is used.

c) The shoreward direction of an oil slick will occur more frequently in the spring and summer than in the fall and winter but no distinction concerning the seasonality factor will be included in the proximity scale. All tracts are considered to be in areas that could produce a shoreward drift of an oil slick at any given time should a spill occur. Although this would be least likely to occur with regard to tracts in the Tarpon Springs and Tampa area. All tracts with the possible exception of those in the Pensacola South area are considered to have an equally low probability of creating a spill.

d) A 12-hour response time is necessary to implement contingency measures to stop or retard oil from reaching shore, or high value, vulnerable resource area. The oil industry presently has a contingency plan for containing and cleaning-up oil spilled in Federal areas of the OCS offshore Louisiana and Texas which meets this response time capability. However, the present capability when extended to the area offshore Mississippi, Alabama and Florida would require a response time of 48 hours. This is considered inadequate. Therefore a special stipulation requiring equipment to be available so as to allow for a 12-hour response time has been recommended (see section IV. D.).

Based on these assumptions each tract is assigned a proximity number based on the following scale (Table 19):

Table 19 Proximity Scale (Oil Spills)

1.0 - Tract is within 7.0 statute miles of shore or significant resource.1/

0.9 " " " 7.1-8.0 " " " " " " "

0.8 " " " 8.1-9.0 " " " " " " "

0.7 " " " 9.1-11.0 " " " " " " "

0.6 " " " 11.1-13.0 " " " " " " "

0.5 " " " 13.1-16.0 " " " " " " "

0.4 " " " 16.1-19.0 " " " " " " "

0.3 " " " 19.1-23.0 " " " " " " "

0.2 " " " 23.1-27.0 " " " " " " "

0.1 " " " 27.1-32.0 " " " " " " "

0.0 " " " 32.1-up " " " " " " "

The proximity scale with regard to structures takes into account their potential impact on shipping and their location in relation to unexplored munitions dumping area. This scale is different than that for oil spills, as shown below (Table 20).

1/ A line 12 miles seaward of the shoreline, outer islands, or unique reef fishing area, where appropriate, represents the point from which proximity of tracts to intensive commercial and sport fishing activities are measured.

Proximity Scale (Structures)* Table 20

1.0 - Tract partially within shipping lane, anchorage area, natural resource system, activity or dumping area.

0.8 - Tract within one mile of shipping lane, anchorage area, natural resource system, activity or dumping area.

0.6 - Tract within 1.1-3 miles of shipping lane, anchorage area, natural resource system, activity or dumping area. 1/

0.4 - Tract within 3.1-6 miles of shipping lane, anchorage area, natural resource system, activity or dumping area. 2/

0.2 - Tract within 6.1-10 miles of shipping lane, anchorage area, natural resource system, activity or dumping area.

0.0 - Tract beyond 10 miles of shipping lane, anchorage area, natural resource system, activity or dumping area.

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* Measurements taken from the edge of a tract to the nearest edge of a shipping lane, anchorage area, natural resource system or activity area including unexplored munitions dumping area.

1/ Tracts ranging in depth from over 90' to 210' are considered to be in an intensive commercial fishery area for only one species, such as brown shrimp. These tracts have been assigned a value of 0.6 to reflect the fact that offshore structures in these water depths will be in proximity to an intensive single species fishery.

2/ Each proposed tract not located in an intensive commercial fishing area has been assigned a value of 0.4. This value has been assigned to reflect the fact that commercial fishing activities occur throughout the Gulf and therefore, all platforms placed on the continental shelf will be in proximity to some kind of commercial fishing activity regardless of water depth or distance from shore.

(C) RELATIVE ENVIRONMENTAL IMPACT FACTOR

A relative environmental impact factor is a product of Importance, and Proximity, and is expressed both for structures, F (St) and oil spills, F (O.S.). The equation for obtaining this factor can be expressed simply as I x P = F (St. or O.S.).

The higher the relative environmental impact factor, the higher the potential for environmental damage. Tracts with overall high environmental indices will be singled out for additional consideration in accordance with the scale below. It is very important for the decision-maker or reviewer to keep in mind the possible synergistic and/or accumulative effects resulting from a tract having one or more categories within a high index range.

This scale of relative environmental impact factors (Table 21) is proposed for determining the potential damage a tract might pose to a significant resource or activity.

Table 21 Relative Environmental Impact Scale

Greater than or equal to 50	Relative environmental impact factor in this range indicates that the tract should be carefully scrutinized. Depending upon the significance and character of the resource that may be affected, possibilities in the decision include: (1) Withdraw the entire tract from the proposed offering. (2) Offer only a portion of the tract. (3) Offer the tract with special stipulations included in the lease to reduce the potential for damage or hazard. (4) Offer the tract because of mitigating circumstances with or without special stipulations.
Greater than zero but less than 50	Relative environmental impact factor in this range indicates that the tract could be developed safely within existing standard practices and operating regulations without significant damage to the resource involved. Additional special stipulations in the lease would not normally be necessary.

The individual, tract-by-tract, matrices have been appended to this statement. See Attachment J. The following section presents a recapitulation of the matrices and the section following that presents a summary risk analysis.

J. Recapitulation of the Matrices

1. Refuges/Management Areas

There are a total of six tracts (Tract Nos. 1, 2, 3, 44, 50, and 51) in this proposed sale that reflect an environmental impact factor for oil spills of 50 in relation to refuges/management areas. This reflects the fact that these tracts range from 14 to 16 miles offshore the Gulf Islands National Seashore or the Breton National Wildlife Refuge and a massive oil spill from any one of the six tracts could impact upon this area.

2. Unique and Highly Productive Areas

(Marsh, Estuary, Nursery)

There are no tracts in this sale which reflect an environmental impact factor of over 30 for oil spills or structures in relation to unique and highly productive areas. This is a result of the fact that most of the tracts are a considerable distance from estuary, marsh, nursery, or other highly productive areas.

3. Biota Seaward of Estuary/Nursery Areas -

All tracts in this proposed sale reflect an environmental impact factor of 40 for oil spills in relation to this natural resource category. Of all the categories included in the matrix analysis, the adverse impact of an oil spill on biota in the open water of the sea, is the one we known the least about. Although data in this area are sparse, some of the effects are discussed in section III of this statement.

4. Beaches -

There are no tracts in this proposed sale which have an environmental impact factor of over 40 for oil spills in relation to beaches.

5. Shipping -

There are a total of 20 tracts (Tract Nos. 2-4, 12, 14-17, 29, 31, 41-43, 47-48, 53, 55-58) in this proposed sale which have an environmental impact factor of 80 for structures in relation to shipping. This is a reflection of the fact that each of these tracts are partially within shipping safety lanes. Two of these tracts (Nos. 3 and 47) lie partially within two safety lanes where they converge. Development of these 20 tracts will be subject to Federal Regulations as described in section IV. B. of this statement.

There are an additional 8 tracts (Nos. 5, 6, 13, 20, 24, 46, 49 and 54) which have an environmental impact factor of 64 for structures in relation to shipping. This is a reflection of the fact that each of these tracts are within one mile of established safety fairways. No other tracts in this proposed sale are within one mile of shipping safety fairways.

There are no established shipping safety lanes east of the Pensacola South No. 1 area. Vessel traffic in this area of the Gulf of Mexico is scattered and, therefore, no determination can be made concerning the proximity of tracts proposed for offering in the Apalachicola South, Tarpon Springs and Tampa areas in relation to shipping.

6. Outdoor Recreation -

There are no tracts in this proposed sale which reflect an environmental impact factor of 50 or more under either structures or oil spills for this category.

7. Commercial Fishing -

There are a total of 39 tracts (Nos. 1-4, 44-46, 50-52 and all tracts in the Apalachicola South area) which have an environmental impact factor of 80 for both oil spills and structures in relation to commercial fishing. In addition, there are 7 tracts (Nos. 42-43, 47-49, and 53-54) which have an environmental impact factor of 80 for structures in relation to commercial fishing and 3 tracts (Nos. 5-6, and 8) which have a factor of 80 for oil spills in relation to commercial fishing. Therefore, there are a total of 49 tracts in this proposed sale which have an environmental impact factor of 80 for either oil spills, structures or both in relation to commercial fishing. Accordingly, these tracts should be carefully scrutinized as part of the decision-making process.

In addition, tract No. 42 has an environmental impact factor of 72 for oil spills in relation to commercial fishing; 3 tracts (Nos. 47, 53, and 54) have factors of 64; and, 2 tracts (Nos. 48 and 49) have factors of 56 for oil spills in relation to commercial fishing activities. This reflects the fact that the above 6 tracts are considered to be in an area whereby an oil spill from any one of them could impact upon commercial fishing activities.

A suggested stipulation concerning the development of all the tracts in this proposed sale has been presented in section IV. B. If adopted, this stipulation would help mitigate the impact resulting from the placement of structures in relation to commercial fishing activities. However, the potential adverse impact on commercial fishing activities and commercial fish species resulting from oil spills cannot be mitigated by a special stipulation.

8. Sport Fishing -

There are a total of 13 tracts (Nos. 1-6, 8, 44-46, and 50-52) which have an environmental impact factor of 80 for oil spills in relation to sport fishing activities. This is a result of the proximity of these tracts to sport fishing areas.

In every case, the environmental impact factor of structurrs for sport fishing is fixed at a zero. This reflects the fact that offshore structures have a favorable impact on sport fishing activities by concentrating fish around the platforms and thereby increasing the average catch. Most of the sport fishing from platforms is undertaken within 30 miles from shore, although some sport fishing craft make overnight trips and can venture out much further. Offshore platforms also serve as aids to navigation, a source of assistance in emergencies and havens for small boats in storms. Platforms resulting from blocks leased as a result of this proposed sale could be expected to have a positive and favorable impact on sport fishing and small boat recreationists over a period of time (up to 20-25 years).

9. Ordnance Disposal Areas -

There are a total of 7 tracts (Nos. 69-72, and 76-78) which have an environmental impact factor of 100 for structures in relation to ordnance disposal areas. Six of these tracts are within a known salvo area, some or all of which harbor unexploded munitions on the ocean floor. Practice bombing is conducted on the Eglin military reserve and occasionally ordnances fail to release. When this happens established water ranges are used for jettisoning hung ordnance.

This ordnance, in the form of unexploded munitions, represents a potential hazard to any activity that involves use of the ocean floor in the disposal areas. In addition, tract No. 72 although outside the salvo areas, is in the area of an unexploded depth charge which was reported in 1956.

In addition, there are 7 tracts (Nos. 73, 79, 80, 83, 84, 85, and 86) that have an environmental impact factor of 80 for the placement of structures in relation to ordnance disposal areas. All of these tracts are outside, but adjacent to, active salvo areas or the area designated as containing an unexploded depth charge.

K. Summary Risk Analysis

Three risk categories will be used to rank the degree of potential hazard the tracts in this proposed sale pose to the environment. These categories are discussed below:

1. High Hazard Potential to the Environment

High hazardous may be defined as a tract which is oil or oil and gas prone and within such close proximity to a high value-critically vulnerable resource as to disallow the minimum present practical response time 1/ necessary to effectuate oil spill containment, clean-up and contingency measures to stop or retard the spill from impacting upon the resource. Also, a tract may be considered highly hazardous if it is oil prone and is wholly located in an unstable sediment zone.

In the draft environmental statement for this proposed sale, six tracts (Nos. 5-10) were tentatively identified as being located in an unstable sediment zone and were, accordingly, placed within the highly hazardous category. In response to this preliminary identification, the Shell Oil Company prepared two reports 2/ 3/ which they submitted at the public hearing held in Tallahassee, Florida, which conclude that "these tracts (Mobile South No. 1 Area, tracts 5-10) are not located in an

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1/ Minimum practical response time would be at least 12 to 18 hours from the time a spill occurred to the time appropriate equipment can be at the spill site.

2/ Bea, R. G., 1973, Sea Floor Stability South Pass Block 62 and Main Pass Block 290 Areas, O.D.C. Report 47, Shell Oil Company, Offshore Division Construction, Southern E & P Region.

3/ Bea, R. G. and Bernard, H. S., 1973, Movements of Bottom Soils in the Mississippi Delta Offshore, O.D.C. Report 44, Shell Oil Company, Offshore Division-Construction, Southern E & P Region.

unstable sediment zone and should not be considered as posing an abnormally high hazard potential to the environment." Six major categories of information were used by the Shell scientists to reach this conclusion concerning the bottom stability conditions in the subject tracts. These were:

1. Location, proximity of tracts to high rate deposition centers on the modern delta, indicates that the area has been relatively unaffected by the delta.
2. Bathymetry, changes in general bathymetric features of tracts in recent past indicates that the area lies outside area of bottom instability caused by delta sediments.
3. Soil Boring Data, near surface soils in area in question are much stronger than on delta with no evidence of soil movement having occurred to significant depths in recent past.
4. Geophysical Data, correlation with core holes and geological data indicates recent soil movements generally restricted to within 12-15 miles of present mouths of river passes.
5. Analytical Model Results, indicate soils in vicinity of Blocks 62 and 290 will remain stable under very severe hurricane conditions.
6. Structural Experience, indicates that soil movement accompanying a major hurricane will be restricted to recent delta sediments.

A staff geophysicist of the Geological Survey has carefully reviewed the two reports provided by Shell Oil Company and has indicated that the technical aspects of the problems are well developed and the reports present a convincing analysis of the bottom conditions in the area of interest. He also points out that Mr. Bea is a recognized authority in submarine slope stability and his work in this field is highly respected. Moreover, Shell has shown a keen interest in bottom stability, at least since 1969 when they lost two platforms in South Pass Block 70 as a result of soil movement triggered by Hurricane Camille. Mr. Bea has written several articles on this subject and both he and Shell Oil have been very cooperative in sharing the results of their findings in this field with the USGS.

In addition, a geophysical contractor presently conducting a high resolution geophysical survey in the area in question was contacted and he reported that he has not seen any hazardous conditions that would justify identification of the tracts reported in the DES as highly hazardous.

At this time, based on the information made available to us, we have no data or analysis that would lead us to conclude that any undue or excessive hazard due to unstable bottom conditions would be encountered during the development of these tracts. Therefore, no tracts in this proposed sale are identified as highly hazardous because of unstable sediments.

Until we receive the information requested from the Department of Defense (see Sec. III. F.), we will tentatively assume that 35 tracts in the Pensacola South No. 1 area 1/ will pose a high hazard potential to the environment. This determination is based upon the fact that the risks associated with development of the tracts in the Pensacola South

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1/ See Attachment C, Tract Nos. 67 through 101.

No. 1 area in relation to military activities are not well understood at this time. This interpretation is tentative and subject to refinement, however, and final judgment concerning the potential harm the development of the 35 tracts might pose to the environment must await receipt of DOD's hazards analysis. This issue will be resolved before any decision is reached concerning whether or not to proceed with the leasing of these 35 tracts.

2. Moderate Hazard Potential to the Environment

Moderately hazardous may be defined as an oil or oil and gas prone tract whose proximity to a high value-critically vulnerable resource does not preclude adequate response time (based on current industry capability in the Gulf of Mexico, offshore Louisiana, and Texas which by a proposed stipulation will be required for the area of this sale too - see section IV.) necessary to effectuate containment, clean-up and contingency measures to stop or retard the spill from impacting upon the unique resource area. However, all oil prone tracts, if not determined to be high hazardous to the environment, are placed in this category for primarily two reasons: (a) all are capable of spilling oil; the effects of an oil spill on open ocean marine biota is also considered adverse although not as severe as the effects on unique (usually nearshore or onshore) high value resources; (b) no clean-up and containment equipment can be effectuated during adverse weather conditions, such as violent storms and hurricanes and none of this type of equipment available today is very effective in five-foot or more seas.

All tracts in this proposed sale, with the exception of the 35 tracts tentatively identified as highly hazardous, are considered to be moderately hazardous to the environment. This is due to the fact that at this time, prior to an established history of drilling activities in the area needed to identify oil or gas fields, all tracts in this proposed sale are considered capable of producing oil and gas. Therefore, none can be identified, at this time, as minimally hazardous even though there is a possibility that some of these tracts may prove to be gas producing only. For specific tract-by-tract characteristics see the appended matrix tables and the preceding section title "Recapitulation of the Matrices".

3. Minimal Hazard Potential to the Environment

Minimally hazardous may be defined as a gas prone tract whose development under existing operating orders, regulations and safety requirements promises a low level of disruption and adverse effects to the environment. Experience indicates that the impacts resulting from development of tracts of this type are not so much ecological in nature as they are conflictual with other uses or activities in a marine area. In most cases, such conflicts or hazards can be mitigated by enforcement of existing regulations or by attaching special conditions or stipulations to the lease concerning its development.

None of the tracts in this proposed sale are considered to be minimally hazardous to the environment because none of them are defined as a gas prone tract only.

BIBLIOGRAPHY

Baker, J. M. 1971. The effects of a single oil spillage. p. 16-20. In. E. B. Cowell (ed.) The ecological effects of oil pollution in littoral communities. Elsevier, London.

Blumer, M. 1969. Oil pollution of the ocean. p. 5-13. In D. P. Hoult (ed.) Oil on the sea. Plenum Press. New York.

Blumer, M. 1971. Scientific aspects of the oil spill problem. Environmental Affairs. 1:54-73.

Blumer, M. G. Souza, and J. Sass. 1970. Hydrocarbon pollution of edible shellfish by an oil spill. Mar. Biol. 5:195-202.

Case, L. C. 1945. Exceptional silurian brine near Bay City, Michigan Bull. Amer. Assoc. Petrol. Geol. 29:567-570.

Chan, G. 1972. A study of the effects of the San Francisco oil spill on marine organisms. Part I. College of Marin, Kentfield, California. 78 p.

Connel, D. W. 1971. Kerosene-like tainting in Australian mullet. Australian Wine Research Institute. Glen Osmond, S. Australia.

Cowell, E. B. 1969. The effect of oil pollution on salt-marsh communities in Pembrokeshire and Cornwall. J. Appl. Ecol. 6:133-142.

Cowell, E. B. and J. M. Baker. 1969. Recovery of a salt marsh in Pembrokeshire, South-west Wales, from pollution by crude oil Biol. Cons. 1:291-295.

Ehrhardt, M. 1972. Petroleum hydrocarbons in oysters from Galveston Bay. Envir. Pol. (in press.).

Environment Editorial Staff. 1971. Horizon to horizon. Environment 13(2):13-21.

Fauchald, K. 1971. The benthic fauna in the Santa Barbara Channel following the January, 1969, oil spill. p. 61-116. In. D. Straughan (ed.) Biological and oceanographic survey of the Santa Barbara Channel oil spill, 1969-1970. Vol. I. Biology and Bacteriology. Sea Grant Pub. No. 2. Allan Hancock Found. Univ. So. Calif. Los Angeles.

Fisher, W. L., J. H. McGowen, L. F. Brown, and C. G. Groat. 1973. Environmental geologic atlas of the Texas coastal zone-Beaumont, Port Arthur area. Bur. Econ. Geol., Univ. Texas. Austin. (in press.)

Galtsoff, P. S. 1959. Environmental requirements of oysters. p. 128-134. In U.S. Dept. Health, Edu. Welfare. "Biological Problems in Water Pollution". Trans. sec. Seminar Biol. Prob. Water Poll., April 20-24, 1959. Cincinnati, Ohio.

Hufford, G. L. 1971. The biological response to oil in the marine environment. Project No. 714141/003 Rep. U. S. Coast Guard. Washington, D.C. 23 p.

Ingle, R. M. 1952. Studies on the effect of dredging operations upon fish and shellfish. Florida State Board of Conservation, Tech. Ser. No. 5. 26 p.

Ingle, R. M. and D. F. Martin. (1971) Prediction of the Florida red tide by means of the iron index. Environmental Letters 1(1):69-74.

Johannes, R. E. In press. Coral reefs and pollution. Proc. FAO Conference in Marine Pollution. Fishing News (Books) Ltd. London.

Keating, B. 1972. The Gulf of Mexico. Viking Press. N.Y. 126 p.

LaRoe, E. T. 1972. Comments on the environmental effects of oil drilling and production. Collier County, Florida., Convervancy.

Levorsen, A. I. 1958. Geology of petroleum. Freeman. San Francisco. 702 p.

Mackin, J. M. 1961. Canal dredging and silting in Louisiana bays. Pub. Inst. Mar. Sci. Univ. Texas. 7:262-314.

Mackin, J. G. 1971. A study of the effect of oil field brine effluents on biotic communities in Texas estuaries. Project No. 735. Texas A & M Res. Found. College Station. Texas. 72 p.

Mackin, J. G. and A. K. Sparks. 1962. A study of the effects on oysters of crude oil loss from a wild well. Texas A & M Univ. Inst. Mar. Sci. Pub. 7:230-261.

Mironov, O. G. 1970. The effect of oil pollution on flora and fauna of Black Sea. Paper presented at Food and Agri. Org. Conf., Rome, Italy. December.

National Marine Fisheries Service. 1971a. Shrimp landings, Current Fisheries Statistics No. 5407. U. S. Dept. Commerce. Washington, D.C. 18 p.

National Marine Fisheries Service. 1971b. Shrimp landings, annual summary 1970. Current Fisheries Statistics No. 5722. U.S. Dept. Commerce. Washington, D.C. 18 p.

National Transportation Safety Board. 1970. Explosions and fire on the Chambers and Kennedy offshore platform, block 189-L and fire on M/V Carryback in Gulf of Mexico. May 28, 1970. U.S. Dept. Transportation, Washington, D. C. 7 p.

Nelson, R. F. 1972. The Bay Marchand Fire. J. Pet. Tech. March, 1972. pp. 225-233.

Nicholson, N. L. and R. L. Cimberg. 1971. The Santa Barbara oil spill of 1969: a post-spill survey of the rocky intertidal. pp. 325-400. In. D. Straughan (ed.) Biological and oceanographic survey of the Santa Barbara Channel oil spill, 1968-1970. Vol. I. Biology and Bacteriology. Sea Grant Pub. No. 2. Allan Hancock Foundation. Univ. So. Calif. Los Angeles.

North, W. J., M. Neushul, and K. A. Clendenning. 1964. Successive biological changes observed in a marine cover exposed to a large spillage of mineral oil. Proc. Symp. Pol. Mar. Microorg. Prod. Petrol., Monaco. pp. 335-354.

Oguri, M. and R. Kantor. 1971. Primary productivity in the Santa Barbara Channel. pp. 17-48. In. D. Straughan (ed.) Biological and oceanographic survey of the Santa Barbara Channel oil spill: 1969-1970. Vol. I. Biology and Bacteriology. Sea Grant Pub. No. 2. Allan Hancock Foundation. Univ. So. Calif. Los Angeles.

Operation Oil. 1970. Report of the task force - Operation Oil (Clean-up of the Arrow oil spill in Chedabucto Bay) to the Minister of Transport. Atlantic Oceano. Lab. Bedford Inst. Dartmouth, Nova Scotia.

Randall, J. E. 1963. An analysis of the fish population of artificial and natural reefs in the Virgin Islands Caribbean. J. Sci. 3:31-47.

Reinhart, P. W. 1970. Oil seepage potentialities of Dos Cuadras oil field, Santa Barbara County, California. Santa Barbara Environmental Quality Advisory Board. 31 p.

Rice, S. D. 1973. Toxicity and avoidance tests with Prudhoe Bay oil and pink salmon fry. Proc. Joint Conf. Prev. Contr. Oil Spills. Washington, D. C. pp. 667-670.

St. Amant, L. S. 1972. The petroleum industry as it effects marine and estuarine ecology. J. Pet. Tech. 24:385-392.

Sanders, H. L., J. F. Grassle, and G. R. Hampson. 1972. The West Falmouth oil spill. Part I. Biology. Woods Hole Oceanographic Institution Tech. Rep. No. WHOI-72-20. 49 p. (Unpublished Manuscript.)

Scarratt, D. J. 1971. Incidence of Bunker C in common benthic animals and sediments. Contrib. Oil Pol. Workshop. Nova Scotia Technical College. Halifax. pp. 4-12.

Shelton, R. G. J. 1971. Effects of oil and oil dispersals on the marine environment. Proc. Roy. Soc. Lond. B. 177:411-422.

Simmons, E. G. 1970. The effects of oil field brine discharges on the ecology of the Chiltipin Creek - Aransas River - Western Copano Bay area. Texas Parks and Wildlife Dept. Unnumbered Report. Austin, Texas.

Spears, R. W. 1970. An evaluation of the effects of crude oil from oil field discharge on aquatic organisms in the Chiltipin Creek - Aransas River - Western Copano Bay - Oso Bay area. Railroad Commission of Texas. Austin. 15 p.

Spooner, M. 1969. Some ecological effects of marine oil pollution. pp. 313-316. Proc. Joint Conf. Prev. Contr. Oil Spills, December 15-17. New York.

Spooner, M. 1970. Oil spill in Tarut Bay, Saudi Arabia. Mar. Poll. Bull. No. 1, pp. 166-167.

Straughan, D. 1971. Oil pollution and seabirds. pp. 307-312 In. D. Straughan (ed.) Biological and oceanographic survey of the Santa Barbara Channel oil spill, 1969-1970. Vol. I. Biology and Bacteriology. Sea Grant Pub. No. 2. Allan Hancock Foundation. Univ. S. California. Los Angeles.

Straughan, D. and R. L. Kolpack (ed.). 1971. Biological and oceanographic survey of the Santa Barbara Channel oil spill, 1969-1970. Allan Hancock Foundation. Univ. So. California. Sea Grant Pub. No. 2., 2 Vols.

Texas Instruments Inc. 1971. Biological assessment of diesel spill, Anacortes, Washington. Prepared for Environmental Protection Agency (Contract No. 68-01-0017), Washington, D. C.

Thomas, M. L. H. 1973. Effects of Bunker C oil on intertidal and lagoonal biota in Chedabucto Bay, Nova Scotia. J. Fish. Res. Board of Canada. Vol. 30 No. 1, pp. 83-90.

Trask, T. 1971. A study of three sandy beaches in the Santa Barbara, California area. pp. 159-178. In. D. Straughan (ed.) Biological and oceanographic survey of the Santa Barbara Channel oil spill, 1969-1970. Vol. I. Biology and Bacteriology. Sea Grant Pub. No. 2. Allan Hancock Foundation. Univ. So. Calif. Los Angeles.

U.S. Department of Interior. 1970. Interim evaluation of environmental impact from the Chevron Company fire and oil spill of coastal Louisiana. A report issued by the Assistant Secretary for Fish, Wildlife and Parks, Washington, D. C. 38.p.

U.S. Fish and Wildlife Service. 1968. Shrimp landings. Current Fisheries Statistics No. 4775. U.S. Dept. Interior. Washington, D. C. 17 p.

U.S. Fish and Wildlife Service. 1970. Shrimp landings. Current Fisheries Statistics No. 5132. U.S. Dept. Interior, Washington, D. C. 16 p.

Zitko, V. and W. V. Carson. 1970. Project Oil chemistry reports. Fisheries Res. Board of Canada. St. Andrews, New Brunswick. (Unpublished Report.)

Berry, W. L. 1972. Pollution control aspects of the Bay Marchand Fire. J. Pet. Tech., March, 1972.

Brownell, R. L. 1971. Whales, dolphins and oil pollution, pp. 255-276. In. D. Straughan (ed.) Biological and oceanographic survey of the Santa Barbara oil spill, 1969-1970. Vol. 1. Univ. So. California. Sea Grant Pub. No. 2.

Florida Coastal Coordinating Council. 1972. Florida Coastal Zone Management Atlas: A Preliminary Survey and Analysis. Dept. of Natural Resources, Tallahassee.

Gulf Regional Planning Commission. 1971. Regional Land Use Plan for Hancock, Harrison, Jackson, and Pearl River Counties, Mississippi. Gulf Regional Planning Commission. Gulfport, Mississippi.

Le Boeuf, B. J. 1971. Oil contamination and elephant seal mortality: a "negative" find. Pp. 277-286. In. D. Straughan (ed.) Biological and oceanographic survey of the Santa Barbara oil spill, 1969-1970. Vol. 1. Univ. So. California. Sea Grant Pub. No. 2.

Nelson-Smith, A. 1970. The problem of oil pollution of the sea. Adv. Mar. Res. 8:215-306.

Massachusetts Institute of Technology. 1973. The Georges Bank petroleum study, Summary. Draft Report No. MIT SG 73-5. Cambridge, Mass. 84 p.

Porricelli, J. D., V. F. Keith, and R. L. Storch. 1972. Tankers and the ecology. Trans. Soc. Naval Arch. Mar. Engineers. 79:169-221.

Rützler, K. and W. Sterrer. 1970. Oil pollution damage observed in tropical communities along the Atlantic seaboard of Panama. Bioscience 20(4):222-224.

South Alabama Regional Planning Commission. 1971. Regional Development Plan 1995. South Alabama Regional Planning Commission. Mobile

Steidinger, K. A. 1973. Phytoplankton, III E-1 to III E-17. In. J. I. Jones, R. E. Ring, M. O. Rinkel, and R. E. Smith (ed.) A summary of knowledge of the eastern Gulf of Mexico. State Univ. System of Florida Inst. Oceanog. St. Petersburg.

IV. MITIGATING MEASURES INCLUDED IN THE PROPOSED ACTION

The Department has developed the following strategy for safe development of the mineral resources of the OCS.

Management of the mineral resources of the OCS will be conducted in such a manner as to cause these resources to make a significant contribution toward supporting the present and future national economy at a rate consistent with maximum possible protection of the environment, orderly and timely development of the resource, and receipt of a fair market value return to the Federal Government.

Reasonably safe development of oil and gas resources on the OCS can be achieved through strict enforcement of lease stipulations and obligations, (detailed in the OCS operating regulations and orders) 1/ and must be based on sound operating practices backed by effective contingency actions in the event that pollution occurs as a result of a natural disaster, human error, or equipment failure.

Research and development programs in exploration, production, transportation, containment and clean-up technology, which provide greater safeguards for the environment, are being conducted by the Department of the Interior, other Federal agencies and

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1/ OCS operating orders for the Gulf of Mexico have been appended to this statement. See Attachment A.

private industry. The Coast Guard in fiscal year 1972 spent in excess of $3,000,000 for research and development on oil containment booms, oil recovery devices and techniques for forecasting movement of oil slicks. The oil industry during the period 1966-72 has reportedly committed nearly $235,000,000 for environmental research and development on air and water pollution. Currently the American Petroleum Institute (API) and the USGS have a cooperative effort underway which will document research work on safety and anti-pollution equipment, recommend additional research, and supervise the management of additional safety or anti-pollution research projects funded by API. As advances are made, OCS operating regulations and orders will be revised and the new technology applied to existing leases as well as new leases. Revisions of the regulations and formulations of lease stipulations may also result from the review of environmental impact statements by the agencies and the interested public.

The following discussion concerns the mitigatory measures which will influence possible adverse impacts that could result from this proposed sale. These measures are presented as they relate to oil spills, offshore structures and pipelines as well as other impact-producing activities associated with OCS oil and gas development.

A. Oil Spills

1. Regulations

Regulations governing OCS oil and gas lease operations in the Gulf of Mexico are contained in Title 30, Code of Federal Regulations and OCS Orders Nos. 1-4, 6, 7, dated August 28, 1969, No. 5, dated June 5, 1972, Nos. 8-9, dated October 20, 1970, No. 11, dated April 5, 1972, and No. 12, dated August 13, 1971. (See Attachment A). Leasing regulations are contained in Title 43, Code of Federal Regulations. The regulations established procedures and requirements to be followed in all stages of lease operations: exploration and development, drilling, production, transportation (pipeline construction and operation) and abandonment.

A general description of operating requirements under the existing regulations follows:

a. Plans: Operating plans must be submitted by the operators and approved by the Geological Survey (GS) before each stage of operations is initiated (exploration, development, abandonment). Approval of all operations must be obtained prior to their commencement.

b. Operator Inspection and Testing: The operator is required to inspect all aspects of the safety systems at specific intervals, e.g., daily pollution inspection on manned facilities, "frequent" inspection on unmanned facilities, monthly test of check valves. Detailed records of inspections and tests are required. 1/

1/ See Vol. 5, Attachment K, for drilling and production inspection report forms and the code book which provides interpretation.

c. Reports: The operator is required to report all spills or leakage of oil to GS without delay. He is also required to notify GS of any unusual condition, problem or malfunction within 24 hours. 1/

d. Safety Devices: Required safety devices include subsurface safety devices, high-low pressure shut-in controls, high liquid level shut-in controls, pressure relief valves, automatic fail-close valves at the well head, automatic fire fighting systems, automatic gas detector and alarm systems, and other safety devices on production equipment; high-low pressure sensing devices and automatic shut-in valves on pipelines; and blowout preventers, related well control equipment, and mud system monitoring equipment on drilling wells.

e. Waste Disposal: The lessee is prohibited from disposing into the ocean any oil (except that oil in produced formation water must average no more than 50 ppm) 2/, untreated waste material or other materials which may be harmful to aquatic life or wildlife. Any drilling mud which may contain toxic substance must

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1/ 30 CFR 250.45.

2/ OCS Order No. 8 (2.A.(5), Gulf of Mexico, Attachment A.

be neutralized before it can be disposed of in the ocean. Drill cuttings and sand must be processed, and oil removed, before they can be disposed of in the ocean. 1/

f. Site Clearance: When an installation is no longer needed for development of the lease, the well is plugged with cement and all casings and piling must be severed and removed to at least 15 feet below the ocean floor and the location must be dragged to clear the site of any obstruction.

g. Debris: Regulations and OCS Orders prohibit the disposal of debris into the Gulf of Mexico. Solid waste must be either incinerated or transported to shore for disposal in accordance with applicable requirements under State and Federal law.

h. Contingency Plans and Equipment: The operator is required to have an approved plan for controlling and removing pollution which provides for

(1) Standby pollution control equipment, including containment booms, skimming apparatus, and approved chemical dispersants immediately available to the operator at a land based location.

(2) Regular inspection and maintenance of such equipment.

1/ Waste disposals must comply with the 1972 Amendments of the Federal Water Pollution Control Act. Permits for disposals must be obtained from EPA under the National Pollutant Discharge Elimination System. See Sec. IV. D. 7. of this volume.

The Oil and Hazardous Substances Pollution Contingency Plan, Gulf Coast Region, is operative and has recently been revised and updated to agree with the National Plan 1/. In addition, the Coast Guard has established the Gulf Coast Team of the National Strike Force (NSF) at the NASA Mississippi Test Facility, Bay St. Louis, Mississippi for the purpose of responding to oil spills in the Gulf of Mexico. The National Strike Force has been established in accordance with the Federal Water Pollution Control Act and the National Oil and Hazardous Substances Contingency Plan.

The Gulf Coast Team is fully operative at this time and presently consists of 11 men with plans to increase to a total of 14 men in the near future. This team is capable of responding to incidents within 2 hours of notification by the appropriate District Commander.

2. Inspection

Evidence of compliance with the regulations and lease requirements is obtained through surveillance of the operations under the lease and enforcement of specific requirements. The inspection system

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1/ See also IV.A.4.b. of this volume and discussion of the National Oil and Hazardous Substances Pollution Contingency Plan.

of the Geological Survey includes: (1) review and approval of plans before each operating stage is initiated, (2) close review and follow-up as necessary, by GS inspectors, of all reports required of the operator by the regulations and orders, (3) on-site inspection and (4) aerial monitoring through the use of helicopters (operators are also required to inform each other of oil spills or other irregularities which they observe).

a. Operator reports: A comprehensive reporting system covering all oil spills and any unusual conditions (for example: reporting and investigation of a persistent oil slick from an unknown source such as a sunken ship or natural oil seep) is required by the orders and is a key factor in monitoring operations. Operators are also required to maintain records for GS inspection of required periodic tests of safety equipment. Compliance with reporting requirements can be assured only by periodic on-the-site inspection and aerial monitoring.

b. On-site Inspection: During the course of drilling, all operations are inspected at least one time. Leases in certain areas or in a particular development stage may require more inspections to assure the achievement of safety objectives. GS is continuing the systematic inspection program and a more stringent enforcement policy. This has resulted in increased operator compliance along with greater coverage of production operations and better documentation of inspection results.

A complete drilling inspection is normally conducted on each drilling rig approximately every six weeks. Random inspections may be made more frequently. Depending on the number of drilling rigs in each District, the frequency of inspections on a rig may vary from six to twelve per year. All producing platforms are inspected at least once a year and random inspections are made more frequently on some. The frequency rate for platform inspections is approximately once every nine months.

The total number of warnings issued and suspensions ordered for infractions of OCS Orders which occurred during normal daily inspections from December 1, 1972, through March 31, 1973, are as follows:

Warnings			Suspensions		
Drilling	Workover	Production	Drilling	Workover	Production
17	1	358	7	0	249

Approximately 60 on-site inspections of pollution incidents were made from December 1, 1972, through March 31, 1973, in response to reports submitted by operators.

Listed below are the results of on-site inspections that resulted in response to findings of pollution surveillance flights conducted from

December 1, 1972, through March 31, 1973:

Pollution Inspections	No. Platforms	No. Wells	Warnings	Suspensions
8	18	274	4	16

A program of intensive inspections is used on OCS leases. Periodically, all available inspectors devote a week to a special inspection, whereupon production platforms and drilling wells are inspected on a random basis; inspections during other periods are conducted on a regular basis with emphasis on operations believed to require special attention. The GS inspector force in the Gulf of Mexico has increased from 7 technicians and 5 engineers as of July 1, 1969 to 28 technicians and 12 engineers as of June 1, 1973. During the period November 1, 1972 to March 31, 1973, these technicians spent 1,341 inspection days or 8,823 man-hours, and engineers 134 inspection days or 1,060 man-hours in the field. Detailed inspections were conducted on 287 major producing platforms in the Gulf of Mexico from December 1, 1972 through March 31, 1973. Also, during this time period, 118 inspections of single wells or satellites were made by boat. Approximately sixty-two percent of these inspections were unannounced. Included in these inspections were 3,036 well completions. Also, during this period, 381 inspections of drilling rigs were conducted. As of March 31, 1973, there were 9,373 completions capable of producing oil and gas on the OCS lands offshore

Louisiana and Texas 1/. Approximately 62 drilling rigs are operating in Gulf of Mexico OCS waters at this time.

c. Aerial Monitoring: "Fly-overs" of the OCS operating areas are programmed on a seven day per week basis by GS inspectors. Any indications of oil pollution or other non-compliance will be followed immediately by an on-site inspection.

During the period January 1 through March 31, 1973, 337 pollution surveillance flights were made. The six helicopters chartered by the Geological Survey for use of the inspecting personnel flew a total of 1,181 hours.

3. Enforcement

The enforcement policy is intended to: (1) reduce the frequency of non-compliance with lease requirements which may lead to loss of life, loss of property, or damage to the environment; and (2) maintain a uniform enforcement policy to be applied to all operations affecting OCS lands in the Gulf of Mexico. When, in the course of an inspection, a requirement pertaining to the prevention of oil pollution or any other safety hazard is found to be in non-compliance, the operation will be shut-in until it is brought into compliance. After a

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1/ This figure does not include service completions.

shut-in, the operation can only be resumed by authorization of the GS; in all cases, this requires reinspection or a waiver of the inspection requirement. Minor incidents of non-compliance may require only a warning that corrections be made within a week. The operations will be shut-in if the required corrections are not made.

Additional penalties for non-compliance are specific in P.L. 83-212, Outer Continental Shelf Lands Act, Sec. 5(a)(2). "Any person who knowingly and willfully violates any rule or regulation prescribed by the Secretary for the prevention of waste, the conservation of the natural resources, or the protection of correlative rights shall be deemed guilty of a misdemeanor and punishable by a fine of not more than $2,000 or by imprisonment, and each day of violation shall be deemed to be a separate offense." Also Sec. 5(b)(1) and (2) provide for cancellation of non-producing and producing leases by notice subject to judicial review or appropriate judicial proceedings.

The following tables (Tables 22, 23, 24) indicate equipment manfunctions detected during inspections and enforcement actions over three separate periods. Minor incidents of non-compliance result in formal warnings while incidents of non-compliance of a potentially more hazardous nature result in well or platform shut-ins until the operation is in full compliance with regulations and orders.

These tables indicate specific items found to be in non-compliace during special inspections. Basic pollution control items of production equipment in which malfunctions were detected for the time periods identified are as follows:

Table 22. EQUIPMENT MALFUNCTION DETECTED DURING JANUARY THROUGH NOVEMBER, 1971 SPECIAL INSPECTIONS

	No. Checked	Operable	Inoperable or not within acceptable tolerances	Percent Failure
Surface Safety valves	2392	2306	86	3.6%
Flowline sensors	4166	4081	85	2.0%
Check Valves	2222	2052	170	7.7%
Pressure vessels				
High pressure sensors	908	875	33	3.6%
Low pressure sensors	765	744	21	2.8%
Low level shut-in	511	481	30	5.9%
High level shut-in	460	439	21	4.6%
Total	11,424	10,978	446	3.9%

Table 23 EQUIPMENT MALFUNCTION DETECTED DURING JANUARY THROUGH NOVEMBER 1972 SPECIAL INSPECTION

	No. Checked	Operable	Inoperable or not within acceptable tolerances	Percent Failure
Surface Safety valves	1533	1480	53	3.5%
Flowline sensors	3021	2982	39	1.3%
Check Valves	1434	1370	64	4.5%
Pressure Vessels				
High pressure sensors	961	942	19	2.0%
Low pressure sensors	610	600	10	1.6%
High level shut-in	351	345	6	1.7%
Low level shut-in	323	314	9	2.8%
Total	8,233	8,033	200	2.4%

Table 24. EQUIPMENT MALFUNCTION DETECTED DURING FIRST QUARTER 1973, (January 1 through March 31) SPECIAL INSPECTIONS

	No. Checked	Operable	Inoperable or Not Within Acceptable Tolerances	Percent Failure
Surface Safety Valves	703	671	32	4.5%
Flowline Sensors	0	0	0	0
Check Valves	690	642	48	7.0%
Pressure Vessels				
High Pressure Sensors	350	345	5	1.4%
Low Pressure Sensors	246	243	3	1.2%
High Level Shut-in	75	74	1	0.9%
Low Level Shut-in	161	158	3	1.9%
Total	2,225	2,133	92	4.1%

Subsurface safety valves and tubings are checked and tested. This requires bringing them out of the well and placing them in a pressure device to test the tolerance of the valves. An average reporting period from February, 1973 through April, 1973 resulted in 3,000 subsurface safety valves and tubing plugs being checked. Of this amount 295 did not meet operating tolerances and were replaced.

Companies fined in District Court for failure to install subsurface safety devices in offshore oil wells during 1970 in the Gulf of Mexico are presented below (Table 25). Each company entered a plea of nolo contendere. The maximum fine for violation of the Outer Continental Shelf Lands Act is $2,000 per count.

Table 25. MAXIMUM FINES

Chevron Oil Company	$1,000,000
Gulf Oil Company	250,000
Tenneco	32,000
Kerr-McGee	20,000
Mobil	150,000
Continental	242,000
Humble	300,000
Shell	340,000
Union of California	24,000
	$2,358,000

No data for direct comparison of pollution incidences for similar time periods before and after the current "more stringent enforcement policy" are available. However, experienced personnel, private and government, are aware that after public attention was focused on the oil spill at Santa Barbara in January 1969, there has been a great deal less oil pollution in the Gulf from normal oil and gas producing operations. The public awareness, concern, and demand to prevent pollution has been a major factor in the reduction of oil spills.

In the past, major events were catalogued, but less serious events were often not reported. Occasionally, some years ago, wells were even intentionally flowed into the water for short periods during clean-up operations. Now, sophisticated burning devices are designed to consume this well clean-up oil without air or water pollution. More automatic equipment is now in use to shut-in production whenever a leak occurs in pipeline or production facilities. These include but are not limited to pressure sensors and high and low level controls. Drip pans are placed under valves, vessels, and the production system to prevent leaking oil from escaping into the waters of the Gulf.

New reporting and investigative procedures established in the last two years have increased many fold the number of pollution incidents reported as well as the time spent by GS personnel in surveillance flights by helicopters in assuring proper documentation of pollution events.

There have been several detailed studies recently completed concerning operating practices on the OCS. The Department's response to these studies and the steps being taken at this time will improve many facets of OCS management practices. For a discussion of these studies see Vol. 1, Sec. 1. H.

4. Contingency Action

Oil spills will occasionally occur as a result of natural disasters, equipment failure or human error. In the event that such an emergency occurs, the following action will be taken:

a. Requirements of OCS Order No. 7 1/

In the case of any spill, the operator is required to initiate action to control and remove the oil pollution in accordance with his approved emergency plan. In any case, a spill or leakage of less than 15 bbls. requires a report from the operator as to the nature of the spill or leakage, why it occurred and what steps were taken to correct it. A spill of 15-20 bbls. must be reported by telephone immediately to GS and confirmed in writing. A spill of over 50 bbls, or one of any magnitude that cannot be immediately controlled, must be reported immediately to the Coast Guard and the Environmental Protection Agency as well as to GS.

b. Regional or National Contingency Plans

If the operator should be unable to control and remove the pollution, the Regional or National Oil and Hazardous

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1/ See Attachment A.

Substances Pollution Contingency Plan may be activated and the designated Federal On Scene Coordinator would direct control and clean-up operations at the operator's expense. This has never been necessary in the case of any spill from OCS operations to date.

The Regional or National Oil and Hazardous Substances Pollution Contingency Plan was developed pursuant to the provisions of the Federal Water Pollution Control Act as amended (33 U.S.C. 1101). Section 11(c)(2) of that statute authorizes the President, within sixty days after the section becomes effective, to prepare and publish such a Plan. The Plan provides for efficient, coordinated, and effective action to minimize damage from oil (and other) discharges, including containment, dispersal, and removal. The Plan includes (a) assignment of duties and responsibilities, (b) identification, procurement, maintenance and storage of equipment and supplies, (c) establishment of a strike force and emergency task forces, (d) a system of surveillance and notice, (e) establishment of a national center to coordinate response operations, (f) procedures and techniques to be employed in identifying, containing, dispersing and removing oil, and (g) a schedule identifying dispersants and other chemicals that may be used in carrying out the Plan, the waters in which they may be used, and quantities which may be safely used. 1/ The Plan is revised from time to time as necessary. Operation

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1/ Annex X of the Plan basically sets forth a no dispersant policy. Exceptions can be made for safety reasons (to prevent fire or explosions) or for certain other circumstances such as the protection of endangered waterfowl. However, the approval of EPA is required, except in case of safety when the approval of the On-Scene Coordinator is required.

of the National Contingency Plan requires a nationwide net of regional contingency plans. Guidelines for that nationwide net are established in the National Plan. This plan provides for a pattern of coordinated and integrated responses to pollution spills by departments and agencies of the Federal Government. It establishes a national response team and provides guidelines for the establishment of regional contingency plans and response teams. The Plan also promotes the coordination and direction of Federal, State, and local response systems and encourages the development of local government and private capabilities to handle such pollution spills.

The objectives of the Plan are: to develop appropriate preventive and preparedness measures and effective systems for discovering and reporting the existence of a pollution spill; to institute promptly, measures to restrict further spread of the pollutant; to assure that the public health, welfare, and natural resources are provided adequate protection; to provide for the application of techniques to clean-up and dispose of the collected pollutants; to provide for a scientific response to spills as appropriate; to provide strike forces of trained personnel and adequate equipment to polluting spills; to institute actions to recover clean-up cost; and, to effect enforcement of existing Federal statutes and regulations issued thereunder. Detailed guidance toward the accomplishment of these objectives is contained in the basic Plan, the annexed, and the regional plans.

The Plan is effective for all United States navigable waters including inland rivers, Great Lakes, coastal territorial waters, and the contiguous zone and high seas beyond this zone where a threat exists to United States waters, shoreface, or shelf-bottom. Its provisions are applicable to all Federal agencies.

A memorandum of understanding between the Departments of the Interior and Transportation outlines the respective responsibilities of the Geological Survey and the Coast Guard under the National Contingency Plan. The GS is responsible for the coordination and direction of measures to abate the source of pollution when the source is an oil, gas, or sulphur well. This responsibility includes the authority to determine whether pollution control operations within a 500 meter radius of the pollution source should be suspended to facilitate measures to abate the source of pollution. The Coast Guard is responsible for coordination and direction of measures to contain and remove pollutants, and shall furnish or provide for the On Scene Coordinator with authority and responsibilities as provided by the National Contingency Plan.

c. Petroleum Industry Contingency Actions

(i) Inventory of Known Resources Available for Emergency Oil Spill Control and Clean-Up

From the upper Texas Coast to the Mississippi Delta region offshore operators maintain a large inventory of various kinds of equipment that could be put to use on short notice for containing and cleaning up an oil spill and killing the source of the spill. This inventory includes 177 boats ranging from 30 foot crewboats to 165 foot utility and cargo vessels, 64 helicopters, 103 fixed-wing aircraft. For a complete inventory of oil spill containment and clean-up equipment see Vol. 5, Attachment L.

(ii) Clean Gulf Associates

Clean Gulf Associates is a non-profit organization formed by thirty-three companies 1/ operating in the OCS. Their purpose is to provide for a stock pile of oil spill containment and clean-up materials for use by member companies in offshore and estuarine areas. Clean Gulf Associates has contracted, effective August 1, 1972, with Halliburton Services to supply equipment, materials and personnel necessary to contain

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1/ These thirty-three member companies produce 98% of offshore petroleum.

and clean-up spills in the Gulf of Mexico to the limits of the OCS lying offshore and seaward of the States of Texas, Louisiana, Mississippi, Alabama, and Florida.

All of the tracts considered in this proposed lease sale fall within this area. Before any drilling commences, should this proposed sale be held, an inventory of pollution combatting equipment would be stockpiled at a strategic location. Should oil reservoirs be found and production ensue, a permanent base for containment and clean-up equipment will be established. For a special stipulation concerning oil spill containment and clean-up equipment available in the proposed sale area see Section IV.D.1.

At the present time, Halliburton maintains four types of recovery/clean-up systems for development at two primary bases located at Intercoastal City, and Grand Isle, Louisiana, and a sub-base at Venice, Louisiana and include:

(1) Fast response open sea/bay skimmer system

(2) High volume open sea skimmer system

(3) Shallow water skimmer system

(4) Auxiliary shallow water and beach clean-up equipment.

For a complete inventory of oil spill containment and clean-up equipment see Vol. 5, Attachment L.

B. Structures

If a ship strays from established safety fairways, oil and gas platforms can pose a hazard to commercial shipping. This hazard, however, is minimized by the fact that safety fairways are clearly designed on navigation charts. Directional drilling from outside safety lanes is used to develop tracts lying partially in safety lanes. Pertinent portions of the Federal Regulations (33 CFR Sec. 209.135(b), 1971), governing shipping fairways and anchorage areas are as follows:

> "The Department of the Army will grant no permits for the erection of structures in the area designated as fairways, since structures located therein would constitute obstructions to navigation. The Department of the Army will grant permits for the erection of structures within an area designated as an anchorage area, but the number of structures will be limited by spacing as follows: The center of a structure to be erected shall be not less than two (2) nautical miles from the center of any existing structures. In a drilling or production complex, associated structures shall be as close together as practicable having the consideration for the safety factors involved. A complex of associated structures, when connected by walkways, shall be considered one structure for the purposes of spacing. A vessel fixed in place by moorings and used in conjunction with the associated structures of a drilling or production complex, shall be considered an attendant vessel and its extent shall include its moorings. When a drilling or production complex includes an attendant vessel and the complex extends more than five hundred (500) yards from the center of the complex, a structure to be erected shall be not closer than two (2) nautical miles from the near outer limit of the complex. An underwater completion installation in an anchorage area shall be considered a structure and shall be marked with a lighted buoy as approved by the United States Coast Guard."

Development of the tracts in this proposed sale which lie partially within shipping fairways or anchorage areas would be subject to Federal regulations as presented above so far as placement of structures is concerned and this would help mitigate any potential impact due to the proximity of structures to relatively high frequency sea traffic.

Commercial vessels are required to report to the Coast Guard whenever a casualty results in any of the following: (a) actual physical damage to property in excess of $1500, (b) material damage affecting the seaworthiness or efficiency of a vessel, (c) stranding or grounding, (d) loss of life, (e) injury causing any person to remain incapacitated for a period in excess of 72 hours; except injury to harbor workers not resulting in death and not resulting from vessel casualty or vessel equipment casualty. Drilling and production platforms (artificial islands) are required to report to the Coast Guard when involved in a casualty or accident and if any of the following occur: (a) if hit by a vessel and damage to property exceeds $1500, (b) damage to fixed structure exceeds $25,000, (c) material damage affecting usefulness of lifesaving or fire-fighting equipment, or (d) loss of life.

Under sone conditions, offshore structures are an obstacle to commercial fishing activities. Depending on currents and underwater obstacles an offshore structure can remove areas of trawling and purse seining waters. Heavy concentrations of platforms can make trawling and purse seining difficult.

The erection of more structures on the OCS may affect commercial fishing operations. The impact from platforms may be kept to a minimum, however, by only allowing those structures necessary for proper development and production of the mineral resources, and by placing them with due regard to fishing operations and other competing uses which are evident at the time of platform approval.

The Area Oil and Gas Supervisor considers the views of commercial fishing organizations such as the Gulf State Marine Fisheries Committee with regard to placement of platforms. The Supervisor also from time to time requests information from the Department of Commerce, National Oceanic and Atmospheric Administration, and National Marine Fisheries Service to be used in his decision-making process of approving or disapproving platform installation. Within the constraints of location of the reservoirs and the technology necessary to drill directional wells, the Supervisor is mindful that platform location is an important consideration for commercial fisheries and does make decisions to minimize the impact of platform location on the commercial fishing industy.

In an effort to further mitigate the impact of offshore structures resulting from this proposed sale with regard to commercial fishing and other significant existing or future uses of the leased area, a lease stipulation giving effect to the following will be applied to all blocks in this proposed offering in the event they should lease:

"Structures for drilling or production shall be kept to the minimum necessary for the proper exploration, development, and production of this leased area, and to the greatest extent consistent with the proper exploration, development, and production of this leased area, shall be placed so as not to interfere with other significant uses of the leased area, including commercial fishing. To this end, no structure for drilling or production may be erected within the leased area until the Area Supervisor, Geological Survey, has found that the structure is necessary, on the basis of existing geological and engineering data, for the proper exploration, development, and production of the leased area. The lessee's exploratory and development plans, filed under 30 CFR 250.34, shall identify the anticipated placement and grouping of necessary structures, showing how such placement and grouping will have the minimum practicable effect on other significant uses of the leased area, including commercial fishing."

C. Pipelines

The potential impact of each specific nearshore and coastal pipeline construction project are considered by the Department in its review of Corps of Engineers permit applications.

The offshore petroleum industry suggests a possible need for several new pipelines in order to develop the tracts proposed in this sale, and has tentatively identified areas of interest for bringing them ashore. The Department of the Interior will receive applications on pipelines to be installed on the OCS and after considering all factors may approve pipeline rights-of-way pursuant to 43 CFR 2883. Authority to grant rights of use or easement for pipelines will be made pursuant to 30 CFR 250.18 and 250.19.

Agencies having responsibility or jurisdiction over all or part of oil and gas pipeline installation or operation in Federal coastal areas are: (1) Department of the Interior, (a) Bureau of Land Management--rights-of-way for common carrier pipelines on the OCS, (b) Geological Survey--jurisdiction over producer owned gathering lines and flow-lines on the OCS, (c) Bureau of Sport Fisheries and Wildlife--protection of fish and wildlife resources and their habitat through consultation with the Corps of Engineers in the process of issuing Federal permits in navigable waters; (2) U.S. Army Corps of Engineers--issues permits for construction (including pipelines) on OCS and in other navigable waters; (3) Federal Power Commission--grants certificates of convenience and necessity prior to construction of interstate natural gas pipelines; (4) Interstate

Commerce Commission--grants approval of the tariff rates for transportation of oil by common-carrier pipelines; (5) Department of Transportation, Office of Pipeline Safety--establishes standards for pipeline construction, operation and maintenance; and (6) Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service--protection of marine fishery resources and their habitat (in coordination with the Bureau of Sport Fisheries and Wildlife), through consultation with the Corps of Engineers in the process of issuing Federal permits in navigable waters.

At present the cooperative effort between the Department of the Interior and the Corps of Engineers, and the National Marine Fisheries Service and State conservation agencies is responsible for minimizing the impact of pipeline (and other) construction in navigable waters of the United States. The Corps of Engineers, through authority of the Rivers and Harbors Act of 1899, (33 U.S.C. 403) asserts authority over, and requires a permit for construction in all navigable waters subject to the Submerged Lands Act (43 U.S.C. §1301) and includes all lands permanently or periodically covered by tidal waters up to the line of mean high tide.

The Environmental Protection Agency reviews and comments on dredging projects in navigable waters in accordance with a memorandum of understanding with the Corps of Engineers dated July 13, 1967.

The National Oceanic and Atmospheric Administration (through its National Marine Fisheries Service) has been vested with responsibility for participation in matters relating to marine and estuarine areas.

The Department of the Interior and its Bureau of Sport Fisheries and Wildlife has responsibility and authority under several statutes, including the Fish and Wildlife Act of 1956, the Estuary Protection Act, the Endangered Species Conservation Act, the Migratory Bird Conservation Act, the Fish and Wildlife Conservation Act, the Marine Mammals Protection Act, and various international treaties enacted to preserve, conserve, protect and enhance fish and wildlife resources and their habitat.

The Bureau of Sport Fisheries and Wildlife, with assistance from appropriate State and Federal agencies, including the National Marine Fisheries Service now reviews all applications to the Corps of Engineers for permits to construct pipelines in navigable waters and assess their potential impact on fish and wildlife resources and the environment. When appropriate, the Bureau recommends to the Corps specific modification of project plans which are needed to reduce impact on these resources. Occasionally a project plan is so conceived that significant impact cannot be avoided, but at the same time, a satisfactory alternative may be available; in such cases, a recommendation that the permit not be issued would be appropriate. At least one court decision has indicated that the Corps of Engineers has the authority under the Rivers and Harbors Act to condition or deny a permit on the basis of environmental considerations. 1/

It can be seen from this presentation that Federal responsibility or authority for pipeline installation or operation on submerged coastal lands is fragmented, with responsibility vested not in one or two agencies, but many, and its jurisdictional authority for pipeline placement limited in a shoreward direction to the line of mean high tide or to where pipelines cross navigable channels. The area of onshore impact from pipeline installation falls within the purview of state or local authorities and private landowners. Much of Mississippi, Alabama and Florida coastal lands outside of parks and refuges are privately owned.

The question the remaining portion of this section on pipelines will attempt to answer is, given the above mentioned authorities and responsibilities, what measures can be taken to mitigate impacts from pipeline installations expected to result from this proposed sale?

Federal, state, or local authorities or private landowners may take measures to require, depending upon circumstances and location, that pipelines be buried; that canals in wetland areas be backfilled where possible, that bulkheads be erected and maintained in marsh areas to prevent saltwater intrusion; that specific types of dredging equipment be used and specific methods for placement or disposal of spoil be

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1/ See Zabel v. Tabb, 430 F. 2n 199 (5th Cir. 1970).

required; that beach and dune areas crossed by pipelines be restored; that pipeline installations in sensitive or valuable areas be seasonally timed so as to occur, for example, during low periods of tourist and recreational activities, or prohibited during acute periods of nesting of waterfowl or migrations of fish and wildlife; or, that pipeline corridors be established.

Some potential adverse effects related to pipeline placements resulting from OCS sales occur onshore and are generally outside our authority to apply mitigatory measures. However, we are in a position to apply mitigatory measures to adverse impacts resulting from pipeline placement in Federal offshore areas. In this context, the Department will establish, wherever feasible, pipeline corridors in the area of this proposed sale. To better accomplish this goal a special stipulation will be applied to all leases that issue in the event this proposed sale should proceed the effect of which will be as follows:

> The lessor specifically reserves the right to require pipelines transporting production from this lease to be placed in certain designated areas or corridors.

We believe that if pipelines which result from this proposed sale are required to be placed in established corridors, wherever feasible, this will allow for accomplishment of the following mitigatory measures:

1. Mitigation of a situation consisting of a scattering of pipelines over a vast area of submerged lands (i.e., the bowl of noodles effect) which presently exists offshore Louisiana.

2. Reduction in the number of incidents involving interference of pipelines with commercial trawl and purse fishing activities by confining or limiting the area of the offshore that can be utilized for pipeline placement.

3. Limitation on the area subjected to bottom disruption and sediment suspension during pipeline placement.

4. Reduction in the number of onshore points needed to bring pipelines ashore thereby reducing areas of beach and shoreline to be disrupted by pipeline excavation.

5. Identification of corridors can be easily plotted on maps thereby providing added protection against ships dropping anchors on pipelines and providing overall for ease in monitoring the lines for leaks and spills.

6. Systemization of pipeline planning and Federal-State cooperation and coordination will be enhanced and can lead to environmental management of pipelines so as to reduce or eliminate adverse effects on highly valuable, critically vulnerable resources and activities of the coastal zone.

To assist the Department in accomplishing this goal, a contract study will be initiated, if this sale is held, with the purpose of identifying and providing information on the potentially least environmentally hazardous areas offshore Mississippi, Alabama and Florida for pipeline corridor locations. This study will be completed within one year from the date this proposed sale is held. Criteria involving pipeline corridor planning will be established giving high priority to protection of bottom and shoreline resources. The results of this study will be analyzed by BLM's Environmental Assessment Team stationed in New Orleans and, after consultation with the Department's Environmental Assessment Committee, preliminary corridor routes will be selected. Once corridor routes are tentatively identified, coordination with appropriate state authorities will be undertaken. A coordinated Federal-State effort is encouraged if corridor routings are to be effectively implemented in such a way as to eliminate or minimize, wherever possible, potential environmental damage resulting from pipeline installations and operations.

The Department will conduct an environmental analysis based on the facts and information generated from the processes outlined above. If it is determined that official establishment of pipeline corridors will constitute a major Federal action requiring preparation of an environmental impact statement then such a statement will be prepared in accordance with Section 102(C) of the National Environmental Policy Act. In any event, corridor routes must be established before any production from this proposed sale ensues. We estimate production could occur within approximately three to five years from the date of the sale.

In addition to the above efforts to mitigate potential impacts associated with pipelines, the Bureau of Land Management and the Geological Survey, by virtue of a memorandum of understanding, have taken steps to clearly define their respective administrative and operational roles for improved OCS pipeline management. The purposes and objectives are to: 1) minimize or eliminate environmental damage; 2) better serve industry and public interests; and 3) streamline the regulations and procedures for most efficient and uniform administration, operation, and industry compliance.

D. Other Mitigatory Measures

1. Special Stipulations

Leases for oil and gas exploration and development are subject to all OCS operating regulations and orders. Additionally, in some cases the lease may include special stipulations which are considered necessary for the protection of a particular resource, or activity, such as the one presented in Part B. above. These stipulations can be designed to meet the needs of a particular resource, e.g., wildlife or waterfowl refuges, fishing areas, certain recreation areas, protection of archeological or historical values, etc., which might be quite sensitive to development of the lease. In this proposed sale, it is believed the following suggested lease stipulations will help mitigate potential impacts on the resources identified below:

(1) It is proposed that a stipulation giving effect to the following be applied to any lease resulting from this proposed sale for the protection of historical, archeological, or architectural values:

> "Upon the discovery of any site, structure or object of historical, architectural, or archeological significance, the operator in charge of any activity related to OCS oil and gas exploration or development, including but not limited to, well-drilling and pipeline and platform placement, shall immediately report the finding to the Manager, New Orleans OCS Office, Bureau of Land Management and to the Area Supervisor, Geological Survey, and make every reasonable effort to preserve and protect the site, structure, or object from damage during the course of his operations."

(2) In addition, a stipulation will be applied to any lease resulting from this proposed sale, the effect of which will be as follows:

> "During all drilling and production activities on the leasehold, the lessee shall maintain, or have available under contract, adequate oil containment and clean-up equipment approved by the Area Supervisor at a readily accessible site. Within twelve hours after notification of the occurrence of a significant oil spill, as determined by the Area Supervisor, distance from shore permitting) the lessee shall have such equipment in use at the site of the oil spill, unless, because of weather and attendant safety of personnel, the Area Supervisor shall modify this requirement."

(3) Additional protection will be provided for the Florida Middle Grounds Area 1/ by application of a stipulation to all blocks in the Apalachicola South area in the event they should be leased; the effect of which will be as follows:

> "No drilling permits will be issued by the Area Supervisor, Geological Survey, until he has found that the lessee's exploratory and development plans filed under 30 CFR 250.34 are adequate to insure that exploration and production operations on the leased area will have no significant adverse effect on the biotic community of the Florida Middle Ground area. To aid him in his findings he shall request a report on these potential effects from the Manager, New Orleans OCS Office, Bureau of Land Management."

The monitoring program proposed in Vol. 1, Sec. I.H. of this statement will apply to all tracts in this area. In addition, because of the

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1/ The Middle Ground area is located in the vicinity of latitude 28° 11' N to 28° 45' N, and longitude 84° 00' W to 84° 25' W. Twenty-five of the 29 tracts in the Apalachicola South area are within the defined Middle Ground area. Four of the proposed tracts (Nos. 127, 128, 129, and 130) in the Apalachicola South area are within one mile of the Middle Ground area.

special value of this area, the expertise of interested experts from the scientific and academic community will be utilized for the purpose of determining the effects of the operation on the biotic community of the area.

(4) Further protection to the environment will result by application of a stipulation to any lease issuing from this sale, the effect of which will be to restrict barging of production:

> "No production other than that needed for testing or defining a field will be barged to shore except in case of emergency conditions or special circumstances relating to safe development and approved by the Area Supervisor."

2. Notices to Lessees and Operators

These notices have the same effect or status as OCS Operating Orders and Regulations and are used when expeditious clarifications or corrections and additions to existing orders and regulations are necessary. By issuing Notices to Lessees and Operators, the extensive amount of time necessary to amend and republish orders and regulations is avoided. One example of a Notice, issued December 11, 1972, explains and details conditions of approval for waste water (oil field brines) disposal from OCS wells at offshore facilities. This Notice provides that such discharges shall meet applicable Federal Environmental Protection Agency or state standards for effluent limitations, whichever are more stringent, and provides for certain monitoring activities. The recent ban on offshore use of PCB's was also implemented by such a notice.

3. Departures

A departure (waiver) from OCS orders or other rules of the GS Supervisor may be granted when such a departure is determined to be necessary for (30 CFR, 250.12(b)):

a) the proper control of a well,
b) conservation of natural resources,
c) protection of aquatic life,
d) protection of human health and safety,
e) protection of property, or
f) protection of the environment.

Waivers are technically based decisions and are granted in situations only where expert judgment determines that better, safer operations would result from operations under the waiver.

4. Research on Advanced Technology

EPA and Coast Guard are conducting research on more efficient containment and recovery devices (booms and skimmers). The efficiency of booms and skimmers depends on sea state and spill conditions but in any case are never 100% efficient. When the results of these studies, and any other similar studies so indicate, the requirement for use of better techniques and equipment will be incorporated into the OCS regulations and orders as appropriate. If incorporated, the requirements will be applied to all leases.

5. Geophysical Information

High-resolution geophysical data covering all tracts to be offered for sale will be purchased and analyzed by GS geophysical personnel. These data, in the area of coverage, provide definitive information on (1) thickness of the unconsolidated sediments (0-300'); (2) structural configurations on shallow seismic horizons (300-500 feet below ocean bottom); (3) anomaly maps identifying sea floor anomalies, and mud mounds, mud waves or potential slide areas, pipeline and other objects on the sea floor, and bore hole locations as interpreted from a combined analysis of several geophysical measurements, and (4) contoured water bottom maps.

Information from these high resolution data are extremely useful in detecting shallow geologic hazards such as potentially unstable bottom conditions (mud waves, etc.), shallow faults, and in some cases, near-surface gas pockets. When these features are identified prior to drilling operations, or platform construction, the operator is notified so he can take the necessary action to assure that his operation is conducted with maximum safety assurance. This is a necessary part of an effective OCS lease management program.

As high resolution geophysical data are generally not gathered until the tracts to be offered for lease are announced, they are not presently available to contribute to a preliminary near-surface analysis. A high resolution data acquisition program is planned for the MAFLA area, however, and data will be available prior to the sale date to support both pre- and post-sale lease management activities.

The latest interpretation of high resolution bottom profile data that will disclose bottom and subsurface conditions that might pose special environmental hazards for drilling or producing operations in the MAFLA area will be made available to the Bureau of Land Management OCS Manager prior to his decision as to whether a lease shall be issued and to the Geological Survey Area Supervisor prior to his approval of drilling operations. 1/

The Conservation Division of the GS is aware of the nearsurface structural configuration and its effect(s) on drilling, fixed-structural emplacements, pipelines, etc., relative to the proposed lease tracts. Knowledge of nearsurface structural conditions is fundamental to a sound lease management program for the OCS.

1/ The District Engineer, Geological Survey will prohibit the placement of platforms on areas of instability, should the need arise, through his authority to issue or not issue permits for platform placement.

Geophysical data, which show the shallow structural and sedimentary environment, are used to predict, and thus minimize, any geologic hazards to drilling operations and consequent possible dangers to the environment, from pollution. Surface and shallow subsurface geologic hazards, when properly identified and correlated with surrounding strata, seldom create insurmountable obstacles to a minimal risk program of exploration and exploitation of economically attractive structures.

6. Conservation Practices

The Oil and Gas Supervisor, in the interest of conservation, is authorized pursuant to the Code of Federal Regulations, to approve well locations and well spacing programs necessary for proper development giving consideration to such factors as the location of drilling platforms, the geological and reservoir characteristics of the field, the number of wells that can be economically drilled, the protection of correlative rights, and the minimizing of unreasonable interference with other uses of the Outer Continental Shelf. The Supervisor draws his authority from the following regulations and OCS operating orders:

> 30 CRF 250.11 outlines in broad terms the Supervisor's authority to control development of the OCS, to protect the environment, and to obtain maximum economic recovery of mineral resources under sound conservation practices.

30 CFR 250.17 dealing with well spacing authorizes approval of well locations, platform locations, and lists factors for consideration in this regard.

30 CFR 250.30 requires lessee's compliance with OCS Orders as well as general regulations and demands all necessary precautions to prevent damage, waste, and injuries.

30 CFR 250.34 requires the lessee to submit to the Oil and Gas Supervisor exploratory drilling plans, lease development plans and applications for permits to drill prior to these drilling programs. The Oil and Gas Supervisor utilizes well information such as electric well logs, core information from other wells previously drilled in the vicinity of the proposed drilling program and geological and geophysical data and other pertinent reservoir information to determine the proper number of wells necessary for development.

30 CFR 250.50 grants the Director authority to demand pooling or unitization which the Secretary is authorized to require under the OCS Lands Act in the interest of conservation.

30 CFR 250.51 refers to the unit plan regulations 30 CFR 226 in regard to obtaining approval of units or cooperative agreements.

30 CFR 250.52 lists purposes for which the Supervisor may approve pooling or drilling agreements.

30 CFR 250.16 authorizes the Supervisor to specify the permissible production of a well. Thereafter, OCS Order No. 11 establishes the production rate control at the Maximum Efficient Rate (MER) of the well or reservoir. MER is defined in OCS Order No. 11, see Attachment A.

7. Other Requirements

In addition to the Interior Department's requirements, the operator must comply with applicable navigation and inspection laws and regulations administered by the U.S. Coast Guard. These relate to safety of personnel and display of prescribed navigational lights and signals for the safety of navigation. Permits to install islands and fixed structures and the drilling of wells from mobile drilling vessels must also be obtained from the U. S. Army Corps of Engineers, which is authorized by the Outer Continental Shelf Lands Act to prevent obstruction to navigation. The decision as to whether a permit will be issued by the Corps of Engineers is based on an evaluation of the impact of the proposed work on the public interest. Factors affecting the public interest according to the Corps of Engineers include, but are not limited to, navigation, fish and wildlife, water quality, economics, conservation, aesthetics, recreation, water supply, flood damage prevention, ecosystems, and, in general, the needs and welfare of the people. Pipeline construction must also be in compliance with standards established by the Office of Pipeline Safety, Department of Transportation. The Department of Labor establishes Occupational Safety and Health Standards which are applicable to OCS operations.

Operators must comply with requirements of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500; 86 Stat. 816) which establishes a National Pollutant Discharge Elimination System, 40 CFR Part 125, 38 F.R. 13528 (1973). This system applies to discharges on the Outer Continental Shelf from any point source and requires any person to obtain a permit from the EPA for the discharge of any pollutant as defined by the Act. Discharges of any pollutant without the necessary permit from EPA is made unlawful by the Act. Pursuant to section 501(b) of the Act, the Department of the Interior has suggested to EPA that the feasibility of a memorandum of understanding between the two agencies be considered in order to facilitate the administration of the NPDES as it applies to discharges arising from OCS lease operations and to minimize any redundancy of efforts by the Geological Survey and EPA.

V. UNAVOIDABLE ADVERSE ENVIRONMENTAL EFFECTS

As described in Vol. 2, Sec. III. A. of this statement, certain features of oil and gas operations cause adverse effects which may be considered unavoidable in the light of current operation practices, technology, and regulations. A capsule summary of the significant effects from this sale are identified below. In addition, although oil spills resulting from this proposed sale are not considered to be unavoidable, some of the effects of an oil spill, if one should occur, are considered unavoidable and are also discussed below.

A. Effect on Marine Organisms

Several oil and gas operations result in temporary increases in turbidity. These operations include the discharge of drilling fluids and the excavation of pipeline trenches by jetting and dredging. When turbidity is generated near the water surface, the depth of penetration of sunlight is diminished. This leads to a decrease in the output of the photosynthetic mechanism of the phytoplankton. The dimensions of the area affected are small and consist of a plume hundreds of yards in length. The duration of the turbidity in a given location will be several hours if the source is pipeline burial operations, and several weeks to several months if the source is drilling fluid discharge. The effect of any decrease in primary production must be considered adverse. The area involved is very small and any reduction would only occur locally and would not involve the entire population of marine organisms.

Clogging of respiratory surfaces and filter-feeding mechanisms could reach a severe level in the benthic animals, however. The result of turbidity will be physiological stress, and possible mortality. This impact will be encountered during pipeline jetting operations and will be restricted to the downstream direction of the ocean current. The duration of the impact in a given area will be no longer than a few hours, but if it occurs in shellfish beds and similar concentrations of organisms the impact would be considered adverse.

Beneath every platform where wells have been drilled is an expanse of cuttings, released during drilling, which has buried and smothered all non-motile benthic forms below it. If it is different in texture and composition from the surrounding sediment, it will not likely be colonized by local forms.

Exposure of biota to harmful or toxic materials released into the marine environment or coastal marsh such as from accidental spills of crude oil, fuel and solvents, and the routine discharge of formation waters will bring about an adverse effect if this occurs. The effects of heavy concentrations of crude oil and petroleum derivatives, depending on their composition, consists of lethal toxicity, sublethal effects, coating with weathered oil, behavioral changes, and habitat changes. The more subtle effects of light contamination may be serious also, but are not well understood at this time. Some specific types of this effect are:

1. Marine phytoplankton have been shown to suffer stress and mortality when exposed to oil during laboratory experiments.

2. Copepods have been found ingesting and passing oil droplets without apparent harm. The copepods, however, serve as an important link in the food chain between phytoplankton and larger animals and ingested hydrocarbons are therefore passed on to larger organisms.

3. All marine plankton present near the core of the plume of formation water, before it is sufficiently diluted by sea water, will suffer stress or mortality from concentrations in the plume. This adverse effect will be immeasurably small at the population level.

4. Laboratory experiments show that fish may be killed during the egg and larval stage after exposure to crude oil. Respiratory surfaces become clogged and damaged in juvenile and adult stages. These effects would occur if spills come in contact with eggs and larvae in the breeding zones.

5. In the event of an onshore oil pipeline leak or spillage on onshore facility, vegetation would be effected according to the severity of the spill. A small leak may do little damage. A severe leak however, may contaminate the substrate and kill the vegetation that comes into direct contact with the oil and several years may be required for recovery. Small animals in contact with the oil would likely be killed.

6. Although large numbers of bird deaths have not been a feature of past oil spills in the Gulf of Mexico, the probability is high that if a large spill come ashore in the eastern Gulf, that large numbers

of shorebirds, wading birds, and waterfowl will be killed-- an exceedingly adverse impact.

Although the potential for harm is present, the inability to predict accidental oil spills makes an assessment of the scope of the effect on birds uncertain.

Damage to immobile, attached, and rooted organisms during excavation and reworking of sediments and soil, and suspension of sedimentary materials can occur from entrenching of subsea pipelines, burial of pipelines through beach and where applicable, adjacent coastal wetlands. During emplacement of subsea pipelines, sediments and benthic animals are washed out by hydraulic jetting. Softer life forms are likely killed, others are made vulnerable to predation, and in immediately adjacent areas of down stream ocean currents, some burial and smothering could be expected. The effect is limited to lcoal areas around drill holes and pipeline paths. In these areas, the effect is adverse and unavoidable.

B. Wetlands and Beaches

If an oil spill impacts upon a beach then there will be an adverse effect, which may last from weeks to several years or more, depending on the amount of oil and size of the area impacted. Heavily contaminated beaches will be rendered unsuitable for recreation so long as they remain contaminated with oil. If mechanical means are employed in beach clean-up operations (bulldozers, front end loaders and other earth moving equipment) as was done following the Santa Barbara and Arrow oil spill incidents then shoreline equilibrium may be upset by beach removal. Excessive removal of beach materials can lead to erosional problems unless enough sand and gravel, for example, are available to replace the removed beach materials.

C. Deterioration of Air Quality

Air quality will not be seriously impaired by routine operations, however, degradation could result from several types of accidents.

In a natural gas leak or gas well blowout degradation would be small; air pollutant would be mostly methane which quickly volatilizes and drifts away. If a fire results, pollutants would be largely carbon dioxide and water vapor.

Oil leaks and oil spills not accompanied by a fire, produce pollutants of lighter ends, i.e., more volatile components of crude oil. Their degree of degradation is unknown, but resultant photochemical smog is a possibility. If the spill results in a fire, large amounts of particulate carbon, and oxides of carbon, along with smaller but unknown amounts of sulfur oxides, nitrogen oxides, evaporated crude oil liquids, and partially oxidized compounds, would enter the air. Local air quality would be severely degraded during the period of the fire. This effect, should a fire occur, would be considered adverse and unavoidable.

D. Deterioration of Water Quality

Degradation of water quality by routine operations will be minimal. Brines added to sea water quickly diffuse through the water column.

Moderate to severe degradation would occur however in the event of an accidental oil leak or spill. The effects of water quality degradation on the biotic community would be the major concern if this occurred. As with all accidents the uncertainty exists, but were it to occur, the effect would be adverse. In addition, water quality degradation will occur onshore if produced waste water is transported to shore for treatment and then discharged into fresh or brackish water systems and operators fail to follow waste water quality standards.

E. Interference with Commercial Fishing Operations

As described in earlie sections, trawling operations suffer interference and inconvenience from oil and gas operations in several ways. A small portion, up to 0.3% of each tract leased,of sea floor is occupied by drilling rigs and platforms and is unavailable to trawl fishermen. Based on past exploration success rates, up to 1,150 acres of sea floor may be occupied by platforms resulting from this proposed sale. Trawling nets, reportedly become entangled on underwater stubs and unburied pipelines, causing damage or loss of the nets. Less frequently, large objects lost overboard off petroleum industry boats and platforms are caught in trawling nets, damaging the net or its catch of fish. The frequency of occurrences of this nature is unknown.

Although commercial fishermen could be expected to avoid the area of an oil spill, spilled oil could coat or contaminate commercial fish species, rendering them unmarketable. This would be another adverse effect to commercial fishing.

F. Interference with Ship Navigation

Very little interference can be expected between drilling rigs and platforms and ships that are utilizing established fairways. However, at night, and especially during rough weather, fog, and heavy seas, ships not navigating the fairways could collide with fixed structures. Also fishing boats engaged in trawling will be inconvenienced by having to navigate around fixed structures located on fishing grounds. Based on past exploration success rates, up to 300 new platforms could result from the proposed sale. Added to the 1,939 platforms now in the Gulf of Mexico the increment is small but still represents a potential increase in possible interference with shipping.

G. Damage to Historical and Archeological Sites, Structures, and Objects

During excavation ferrous objects above a certain size will be detected by magnetometer surveys of proposed pipeline routes. Other as yet undiscovered sites, objects, or structures not detectable by such surveys will probably be damaged if they are in the path of pipelines. These sites, structures and objects can be located on the continental shelf as well as onshore. The incidence of this occurrence is considered to be low. Were it to occur it would be considered to have an adverse effect.

Other damage to archeological resources could come from oil contamination. Historical and archeological materials soiled by an accidental oil spill may not survive subsequent cleaning and restoration efforts. Porous materials could be rendered unsuitable for carbon dating techniques. The uncertainty that such a polluting event will occur is large and the potential for significant resource destruction appears small, although it does exist.

H. Interference with Recreational Activities

Interference with recreation is closely related to degradation of aesthetic values. Oil contaminated beaches, freshly cut pipeline route terminals and other onshore support facilities would normally be avoided by those seeking recreation sites for use or development. Disturbance of beaches by pipeline burial operations will be very short-lived, relative to recreational use. Oiled beaches may require days, weeks, or years for adequate restorations if they become damaged. The uncertainty of accidental spills is applicable to this event also, but if spilled oil ever reached the beach it would have an adverse effect on recreational opportunities.

I. Degradation of Aesthetic Values

Platforms and drillings rigs on seven tracts included in this proposal and located between 14 and 17 miles from the Chandeleur Islands and the islands marking the seaward boundary of Mississippi Sound will be visible to an island viewer. None will be visible to the naked eye of a mainland viewer. A few onshore pipeline terminals and treatment facilities will be constructed as a result of this proposed sale. If these objects interfere with residential or recreational vistas, the visual effect would probably be considered adverse. The incremental addition to what exists in the region is small, however. The effect, therefor, is considered small.

Spilled oil and debris floating in the water or washed up on the beach would also severely detract from the scenic values of any local area. Considerable uncertainty attaches to this possible effect. Before the natural terrain and vegetation has been completely restored, the effects of pipeline burial will appear as a large scar traversing the beach and coastal lands. Restoration over most of the scar will require at least one year. This latter effect is important only in the few (up to 4) vicinities where new pipelines will cross the shore area and although temporarily adverse it is generally of minor significance.

J. Conflict with Other Uses of the Land

Small amounts of land, during the laying of pipeline and the construction of pipeline terminal or other onshore facilities if located in agricultural areas will be temporarily lost for grazing or farming purposes. Interruption until the following growing season usually results. The existence of pipeline terminal facilities and storage and pumping facilities will involve the permanent loss of anywhere from one to an estimated 200 acres for grazing or farming, because each facility usually is enclosed by a fence. A pipeline leak, however, involving the release of oil into farm land would render the land contaminated and unsuitable for grazing or other agricultural purposes. One to several growing seasons might be required for recovery of affected vegetation and degradation of spilled oil. The low probability of this effect and the relatively small areas involved indicate it is minor, although were it to occur it would be considered adverse.

K. Conflict with Military Uses of the Continental Shelf

A potential hazard exists during the placement of drilling rigs, or producing platforms, and the laying of pipelines, or during the course of any operations that involve contact with the ocean bottom in areas used for munitions disposal. If a bomb was accidentally detonated on the ocean floor in proximity to a drill rig, producing platform or pipeline then the resulting concussion could cause property damage, loss of life, oil spills, gas blowouts, fires or other polluting events. The probability of occurrence will be low if locating and plotting areas of the ocean bottom in which contact will be made is undertaken using magnetometer surveys, divers and sophisticated detection devices suitable for use in underwater conditions.

We have requested the Department of Defense to submit a probability analysis concerning interference with military uses and activities with regard to tracts 67 through 101 in the Pensacola South No. 1 area. At this time it is not known if this hazard is unavoidable. Therefore, final determination concerning this matter will be made following receipt of the analysis and prior to any decision concerning whether or not to proceed with the leasing of these subject tracts.

VI. RELATIONSHIP BETWEEN LOCAL SHORT-TERM USE AND MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The principal short-term use of the proposed sale area will be the extraction of oil and gas from those tracts which prove economically productive. This mineral extraction will contribute to the diminishment of the long-term productivity of the non-renewable oil and gas resources of the Gulf of Mexico and possibly to marine and coastal resources.

To date, there has been no discernable decrease in marine productivity in OCS areas where oil and gas have been produced for many years. Concern has been expressed regarding the possibility of long-term reduction in productivity of the overall ecosystem resulting from continued oil and other discharges being spilled into the water.

The possibility that the implementation of the proposed lease sale together with existing production on the Outer Continental Shelf might sacrifice the long-term productivity of the area to the short-term use of non-renewable mineral resources must be recognized even though the long-term effects of oil spillage into the environment are not clearly understood at this time.

The additional stress which the ecosystem can absorb is limited, but at present, the bounds of these limitations are not known. St. Amant observes, " Certainly the significance of the continual addition to and accumulative effect of sublethal pollutants in the environment is probably the most important ecological question facing us today." 1/

1/ St. Amant, Lyle S., "Biological Effects of Petroleum Exploration and Production in Coastal Louisiana," Louisiana Wildlife and Fisheries Commission, December 1970. p. 20.

It is not anticipated that other impacts caused by oil and gas operations will decrease either short-term or long-term productivity in the ocean.

Disturbance of coastal land by pipeline construction and burial operations and construction of related onshore facilities will decrease productivity in the short-term. Useful productivity of coastal lands in the area disturbed by pipeline operations will decrease following the disturbance and will rise to natural levels as original conditions are restored in subsequent growing seasons. Light grazing or farming pressure most likely will not have any effect, but heavy grazing or farming could serve to keep the disturbed areas from recovering at an optimum rate. Species diversity in the disturbed area will be low during the recovery period.

Based on past leasing and exploration experience, as many as 75-125 new platforms will be emplaced as a result of this proposal.

The cumulative affect of structures on multiple-uses in offshore areas where more and more structures are required as OCS production increases is one of concern. The cumulative nature of structures as hazards to commercial shipping and as obstructions to commercial fishing activities represents a use conflict that can be controlled through proper planning and coordination with appropriate Federal and state agencies and private industry. Some leveling out in overall numbers of platforms in the Gulf of Mexico is expected as more and more areas decrease or go out of production and platforms are removed. This same feature is also expected with regard to the cumulative numbers and length in miles of pipelines to shore. In the case of pipelines, as more and more areas begin to approach termination of production, some additional capacity will be available in existing pipelines to carry production from new areas thereby reducing the numbers of new pipelines required to move production to shore. We are unable to determine at this time if the total number of platforms and pipelines required to develop the OCS areas in the Gulf of Mexico has peaked but indications are that conditions are approaching a leveling off point.

A particular areas of concern is expressed with regard to the petroleum industry's impact in the marshlands of Louisiana. There is convincing scientific evidence that their activities, associated with oil and gas production in the marshlands, have contributed to marsh destruction and land loss that could very well prove to decrease the long-term productivity of the area for the short-term use of minerals extraction. This matter is being closely monitored by scientists from Louisiana and others. The single most damaging activity associated with the petroleum industry's operations in the marshlands is the construction of rig access canals. This feature is not associated however, with oil and gas production activities on the Outer Continental Shelf and therefore can be eliminated from consideration as a potential adverse impact resulting from OCS operations. The construction of onshore facilities and pipeline canals in or through marsh areas, however, does represent a potential source of impact ancillary to, but associated with, OCS production. The potential for a decrease in long-term productivity resulting from onshore activities related to OCS operations is present and should be given careful consideration by state and local authorities before approving or denying the use of their marshlands for such purposes.

From the information at hand, long-term productivity of the Gulf environment, we believe, is not being reduced by oil and gas activities on the Outer Continental Shelf.

VII. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

A. Mineral Resources

The leasing of the proposed tracts in this sale would permit development and extraction of the leasable minerals. This lease sale could result in an estimated range of production of 1.5-2.4 billion barrels of oil and 1.8-2.9 trillion cubic feet of gas which would represent an irreversible and irretrievable commitment of mineral resources.

B. Land Resources

Industry has estimated the need for 3 gas and 3 to 9 oil pipelines to shore to develop the estimated reserves from this proposed sale. In connection with these pipelines, approximately 5 new onshore pipeline terminal stations, and storage and pumping facilities will be constructed. This construction would involve the irretrievable commitment of approximately 200 acres of coastal lands for station or facility sites. Physical removal of habitat representing an irreversible and irretrievable commitment of a resource on which fish and wildlife rely will occur in the area required for construction of pipeline terminals and storage and pumping facilities.

C. Fish and Wildlife Resources

An irreversible or irretrievable commitment of fish and wildlife resources and their habitats could occur in the area of a massive oil spill or if frequently subjected to chronic low levels of oil pollution. At this time, there is insufficient evidence to conclude that low level spillage has led to an irreversible commitment of fish and wildlife resources but there is enough evidence to indicate that this is a possibility that deserves close attention, and constant study.

An irreversible or irretrievable commitment of habitat in the area required for construction of pipeline related support facilities, estimated at 200 acres, will occur if this sale proceeds. This could have an irreversible or irretrievable synergistic effect on any fish and wildlife dependant upon the habitat in the construction area.

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